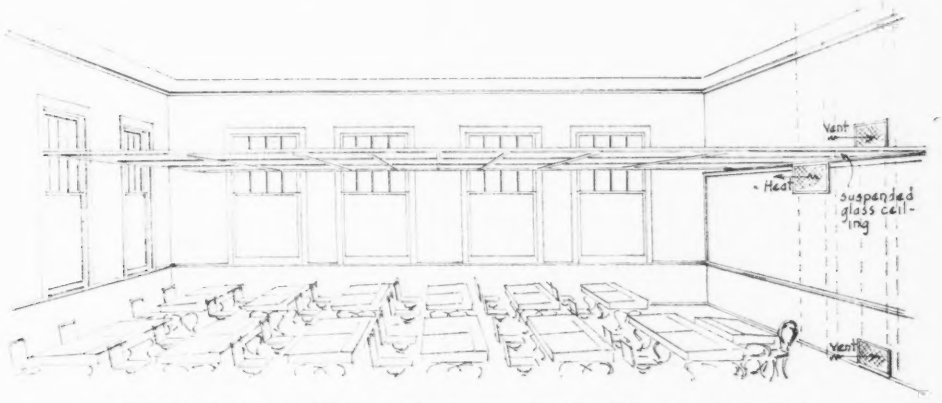
THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK OCTOBER, 1910

A Scheme for Facilitating the Heating and Ventilation of School Rooms

A unique arrangement designed to increase the effectiveness of heating and ventilating apparatus in such apartments as school rooms is illustrated in the accompanying sketches, in which it will be noted that the idea involves the use of a suspended ceiling of glass hung above the pupils' heads. The scheme was presented at the recent meeting of the heating engineers' society in St. Louis by Francis W. McGuire, of Rockford, Ill., by whom it was developed. In describing the idea, Mr. McGuire says:

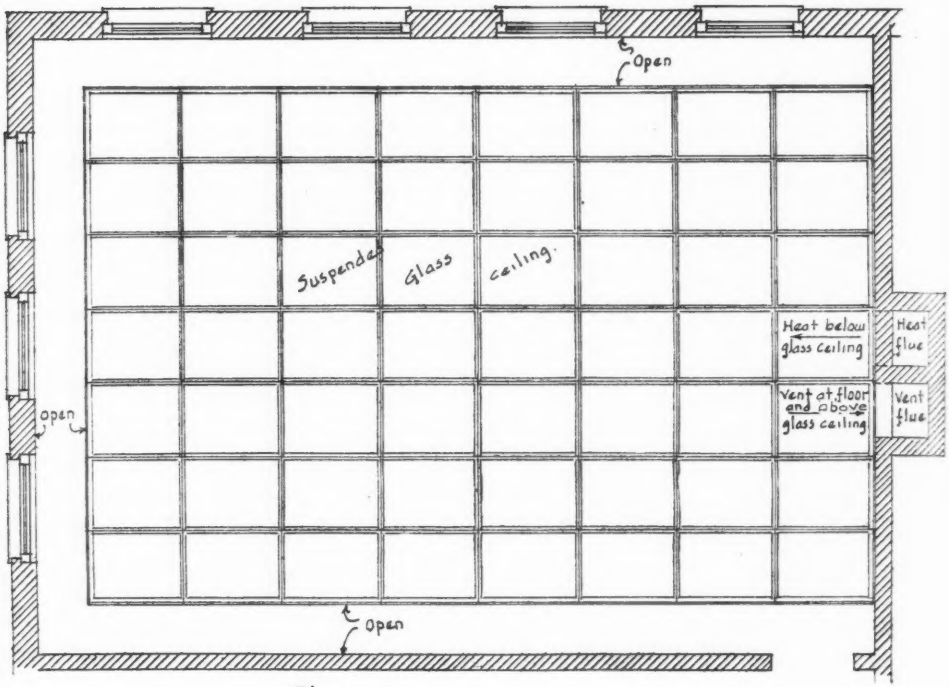


APPEARANCE OF SCHOOL ROOM WITH SUSPENDED GLASS CEILING

"The principal benefit to be derived from the suspended ceiling is that it introduces the fresh air at or nearest the breathing line, and distributes it equally from the point of its introduction into the room. Thus the air does not travel to the upper part of the room first and there become contaminated by the foulness of the ceiling caused by the settlings on the ceiling. The impurities that may accumulate in the air are either forced to the floor line or are carried to the top of the room by way of the space alongside of the walls, as either of their weights may determine, thereby giving a pure stratum of air at or nearest the breathing line.

The benefits from a heating standpoint are that the warm air is forced to the sides of the room first, and in this way warms the air near the windows and walls.

In the discussion of Mr. McGuire's idea, Secretary W. M. Mackay stated that such a construction would not

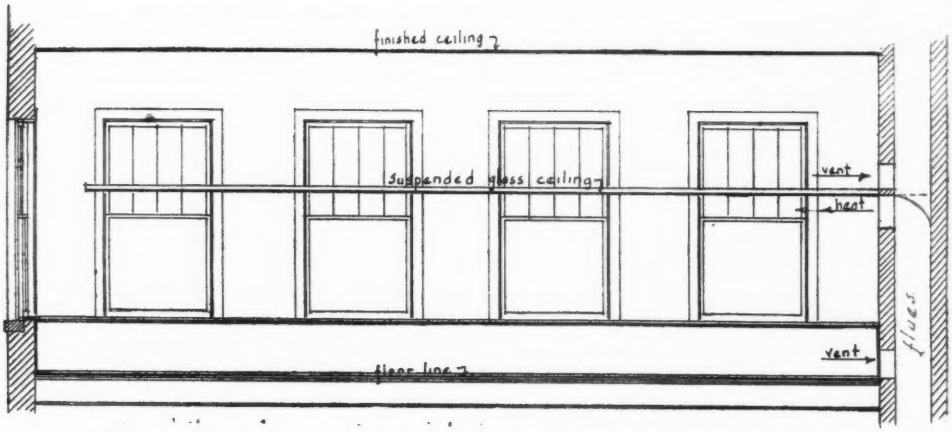


PLAN OF SCHOOL ROOM, SHOWING SUSPENDED CEILING

comply with the State laws which call for a 12 to 13-foot ceiling, that the space above would be considered dead space, and that the ventilation into the same flue would interfere with the lower ventilation.

Mr. McGuire holds that it would hardly violate the State laws, as the height of the room remains 12 to 13 feet, that the space above is not dead space, inasmuch as the cooling surface of the windows and outside wall are the prime factors in air movements and the small opening in the vent flue in the upper portion of room only tends to stimulate the otherwise sluggish movement from the lower section of the flue.

Another speaker stated that the upper surface of the suspended ceiling would gather dust from the sweeping of the room. Mr. McGuire holds that this is one of the good features of the arrangement, inasmuch as it shows that the dust, if in the room, remains there, either at the ceiling or floor line.



SECTIONAL VIEW OF SCHOOL ROOM WITH SUSPENDED GLASS CEILING

or both, and if this arrangement will collect the dust (each panel of glass being removable) it would necessitate the frequent cleaning or washing of the surface and by so doing would remove some of the impurities that would otherwise remain in the room.

Prof. J. H. Kinealy stated that in ordinary constructions, with a proper size of flue and a sufficient amount of heat, it is possible to heat a school room so that there will not be more than 2° difference in any part of the occupied room.

"Allowing this to be true," says Mr. McGuire, "which is unusual and very seldom accomplished, it refers to heating only, and we all know a room can be satisfactorily heated. But is it not a fact that any impurities that have accumulated in any part of the room or clothing of the occupants will settle down by gravity all through the breathing space or rise upward the same way, and are, therefore, always present in the breathing space? This is the principal fault of heating systems, and was not this the principal reason for the elimination of direct radiation?"

The Decentralized Plant as the Power Plant of the Future

HOW IT WILL BE DESIGNED AND OPERATED TO SUPPLY HEAT, AS WELL AS POWER AND LIGHT

By R. D. DeWolf

In a remarkable paper read before the National Electric Light Association, the author, Mr. R. D. DeWolf, of the Rochester (N. Y.) Railway and Light Co., draws a picture of the power plant of the future which is calculated to combine at once the advantages of the central heating station with those of the isolated plant. The principal portions of his paper follow:

The tendency of modern power-plant practice is toward centralization and combination — centralization of plants and units and combinations of systems and companies. By this means substantial economies have been effected in operating costs, fixed charges and the general efficiency of power generation.

This development has been founded on the idea that the sole purpose of a power station is to generate electric power—to convert the greatest possible number of heat units delivered from the boiler room into electric energy units delivered to the switchboard. The heat rejected by the engine, not being of further use in the power plant, is thrown away, hence the very logical concentration of the power-generating units and the development of apparatus, which is inherently of a very expensive type and requires expert superintendence, high repair costs, etc.

A NEW CONCEPTION OF THE FUNCTIONS OF A POWER PLANT

Let us now change our viewpoint of a power plant and, instead of regarding it as a means of generating electrical power, regard it as a means of generating heat energy and putting this energy in such shape that it can be sold. To get a high efficiency throughout the year, this can best be done by a parallel operation of condensing power stations, having a high thermal efficiency of both boilers and engines, and non-condensing power and heating stations, having a high thermal efficiency in the boiler room but a low thermal efficiency in the engine room.

Some of our large condensing plants operating under conditions as nearly perfect as extreme care and attention can make them, will generate one K.W. H. on 2 lbs. of coal. This means that, out of the 28,000 B. T. U's contained in the coal, the plant is rendering available for sale about 3,400 units; or, assuming a boiler and furnace efficiency

of 70%, the engine is rendering available for sale 3,400 units out of 19,600 The remaining 16,200 being unsalable, are thrown away. The decentralized power and heating plant will enable us to sell this heat energy by adding a little more to it and putting it in a salable condition; and under certain conditions and with a proper combination of plants of different types, this will be the most efficient method of disposing of the heat energy generated in the plant.

THE CARNOT CYCLE NO LONGER APPLICABLE

This brings us to a new understanding of the Carnot cycle and the kind of efficiency which should be aimed at in plants of this type. The potential energy of the fuel can be dissipated in but five ways:

1—Heat lost by radiation from the engine and the boiler.

2—Heat lost up the chimney by incomplete combustion and high flue gas temperature.

3—Heat which is converted into available mechanical energy by the engine.

4—Heat which is converted into mechanical energy, but is lost in friction in the apparatus.

5—Heat which is rejected by the engine at the end of its cycle.

Carnot's cycle is ordinarily accepted as representing the maximum efficiency which can be reached in the use of the potential energy of the steam, and this rests upon the assumption that the heat rejected at the end of the cycle is useless. On this basis of Carnot's cycle, every effort has been made to increase the thermal efficiency of the engine.

When, however, the rejected heat can be made available for further use, the economic fallacy of the cycle, as it is ordinarily applied, is at once apparent. We are now interested, not in the thermal efficiency of the engine alone, but in the thermal efficiency of the process as a whole; that is, in the ratio of the heat utilized to the heat supplied.

Practically speaking, this means the ratio of the heat in the fuel, minus the heat in the condensation returns and the various heat losses, to the original heat energy in the fuel. The thermal efficiency of the engine is now only a part of the story, and the smaller part at that. If, by decreasing the engine thermal efficiency the thermal efficiency of the remainder of the process can be increased, the use of high-grade types of engines would be bad engineering practice; and this means that we must accustom ourselves to the term "back pressure," recognize that it has gained 99% of its present bad repute from its association with the generally accepted interpretation of the Carnot cycle, and see that our ideas concerning it must be revised when we come to consider it as a part of the more complete process of the conversion and sale of heat.

The various thermal efficiencies can be expressed symbolically as follows:

Let,

H=Total heat in the steam at boiler pressure.

h_e=Heat in the steam as delivered by the engine to the heating system.

h_c=Heat in condensation returns.

E=Total thermal efficiency of the process as a whole.

E_e=Thermal efficiency of the engine.

E_h=Thermal efficiency of the heating system.

Then, neglecting losses by radiation and mechanical friction,

$$E = E_e + E_h = \frac{H - h_e}{H}$$

$$E_e = \frac{H - h_e}{H}$$

$$E_h = \frac{h_e - h_c}{H}$$

with reference to the total amount of heat supplied by the boiler.

It is then readily seen that so far as any theoretical thermal considerations are concerned the quantity h_e is indeterminate, as it is a function of the temperature and pressure at the engine exhaust. The back pressure on the engine has no effect on the total thermal efficiency of the process so

long as we are considering the process as theoretically perfect.

The thermal efficiency of the engine, per se, is no longer a matter of vital importance, but the mechanical efficiency of the engine, the radiation losses and the mechanical efficiency of the power generator are vitally important, also the radiation losses and the leakage in the heating system. Thus we can dispense with those refinements in steam-engine practice which increase the thermal efficiency and reduce our power plant to its simplest, most easily operated elements, reducing at once the initial cost of the power plant, the fixed charges, the operating expense, the cost of supplies and repairs and the degree of skill necessary to handle the plant.

The determination of the proper value of h e, or the heat energy delivered by the engine to the heating system, is a problem which must be solved for the conditions existing in each installation. Generally speaking, it will be dependent upon the mechanical efficiency of the engine and the heating system, the heat losses from each, the relative selling value of a power unit and a heat unit, and the relative demand. In practical terms, the answer will be the back pressure at which it will be most economical to operate the engine under the given set of conditions. As the value of h e is varied, and consequently the back pressure is varied, certain changes in these various items will take place.

ENGINES AND GENERATOR: SHOULD BE OPERATED AT OR NEAR FULL LOAD

This combined efficiency varies with the load, and to get a good efficiency the apparatus should be operated at or near full load. As the back pressure rises, the mean effective pressure for a given point of cut-off decreases. Hence, to keep the power output constant, the cut-off must be made later, and less power will be generated per pound of steam; as the back pressure falls the converse is true.

FRICTION LOSSES THE PRINCIPAL ONES IN THE HEATING SYSTEM

It is assumed that the system is properly constructed so that the radiators will not allow uncondensed steam to pass through. The losses, as in the case of the steam engine, are friction losses, and the energy required manifests itself in the generation of heat; with a well-insulated system this heat will be of value in re-evaporating condensation. Hence, unlike the energy used up in friction in the engine, which is lost, the energy used up in friction in the pipes is not altogether lost, but is either returned to the steam or forms a portion of the radiation losses from the pipe.

RADIATION LOSSES CONSTANT

The energy lost from a radiating surface is proportional to the difference in temperature between the inner and outer surfaces. Hence with a given difference in temperature the radiation loss is constant irrespective of the amount of heat passing the inner surface. Bearing this point in mind, let us analyze the effect of variation in back pressure on the radiation losses in the engine and the heating system.

RADIATION LOSSES IN ENGINE

As the back pressure is increased, the mean temperature of the cylinder walls is increased, and the pounds of steam flowing through the engine for a given load is increased. With a given engine and initial steam pressure, if the increase in the rate of flow of heat through the engine, due to the increased rate of flow of steam, is greater than the increased radiation loss from the cylinder walls, the resultant loss of heat per pound of steam will be decreased and the efficiency of the complete process increased, since the larger amount of heat in the exhaust from the engine can be made available in the heating system. The relative rate of increase of heat radiation from the engine and increase in steam consumption depends upon the design. The radiating surface should be a minimum, and it should be thoroughly insulated. Under these conditions an increased back pressure will effect a decreased loss of heat per pound of steam. With a decreased back pressure the converse is true.

RADIATION LOSSES IN THE HEAT TRANSMISSION PIPES

As the back pressure is increased the velocity of the steam will be increased, the quantity of steam transmitted increased, and the mean temperature of the inner surface of the pipe increased. If the increase in the rate of flow of heat through the pipe, due to increased rate of flow of steam, is greater than the increased radiation loss from the pipe, the loss of heat per pound of steam will be decreased and the efficiency of the complete process increased, as more heat per pound of steam will be delivered to the radiator.

So far as the heat losses are concerned, it is then evident that the determination of the proper back pressure depends upon the design of the engine and the effectiveness of the heat insulator used on the cylinder and on the pipe line. Such matters as clearance volume and cylinder condensation are of secondary importance, for the engine is now nothing but a reducing valve.

HEAT NOW REQUIRED IN MANY MANUFACTURING PROCESSES

The importance of building up as large an all-year steam load as possible is evident, and I think this is a matter to which central stations can well devote their attention. Many manufacturing processes require the use of heat, which is now generally furnished by live steam, the apparatus being so designed that a moderate pressure is necessary. Much of this apparatus could be comparatively easily changed over to use low-pressure steam and become a steady all-the-year load. Exhaust steam could also be used to furnish hot water and for certain kitchen and laundry work.

When steam turbines are employed as prime movers, the turbine can be bled to furnish steam at a higher pressure than the exhaust when a comparatively small amount of high-pressure steam is required. The exhaust steam, being free from oil, is available for purposes where the exhaust from a reciprocating engine would be objectionable. By this means the summer demand for steam could be encouraged, for the greater the load which can be carried on the decentralized plant during the summer the less power it will be necessary to furnish from the condensing station, and the less copper it will be necessary to install to transmit this power from the condensing station to the point near which the decentralized plant is located.

IMPORTANCE OF BALANCING HEAT AND POWER LOADS

The ratio of the steam required for the generation of the power demanded by a customer to the steam required to meet his heating requirements is a matter of vital importance, and one which should be taken into consideration in making steam or electric rates. If this ratio is exactly 1, his demands just balance up and give the plant supplying him the most economical operating conditions. If he requires more power than heat, his ratio will be more than 1, and the plant supplying him will have to throw away exhaust steam. If he requires more heat than power, the plant supplying him will have to furnish some live steam for heating. In either case the total cost of supplying the customer will be greater than when the ratio is 1.

A sliding-rate system for steam should be worked out wherein account is taken of the quantity of steam consumed and the ratio between steam for power generation and steam for heating. The ratio would be determined by assuming an average number of pounds of steam per K.W.H. multiplying by the number of K.W.H. used per month and dividing by the number of pounds of steam used for heating during the month. If the power demand has a poor load-factor, the electric rate should compensate for this, which will be done if a sliding rate is used which varies according to the hours' use of the maximum demand. A customer would then be in a position to earn a better rate for himself by adjusting his loads so as to make this ratio as near unity as possible, and he would be encouraged in arranging his industrial

apparatus for the use of low-pressure exhaust steam. A rate of this kind would show a customer the advantages which he could derive from the use of light, power and heat from the central station in about as simple and striking a manner as possible.

The central-station companies have been discouraged from taking on business of this character largely on account of the difficulties and failures which have been experienced by the live steam heating companies and the high initial cost and losses attending the transmission of steam considerable distances.

THE PROBLEM SOLVED BY THE OPERATION OF DECENTRALIZED PLANTS

With long transmission lines the heat losses from the steam during transmission may be so serious that the customer will be unable to get anything except hot water, and he is forced to the conclusion that in order to get satisfactory service the steam must be generated on or near his own premises. The decentralized plant will enable the central-station company to meet his objections on this point, and to furnish service fully as satisfactory as that from the customer's own boiler. The customer will have a further great advantage in that the heavy cost of banking boilers ten to twelve hours per day is eliminated, and any temporary decreased use of steam will show a corresponding decrease in the condensation meter reading. Whereas, if he were burning his own coal, there would hardly be a perceptible decrease in the coal consumed. A meter is a much more delicate indicating apparatus than a coal pile.

CENTRAL POWER STATIONS PASSING A CRITICAL PERIOD

A majority of the large central stations in the country, having secured the bulk of the small light and power business, have now reached a point where their further development depends upon their taking on business of a larger character and their ability to supplant the isolated plant. Unless a satisfactory supply of heat can be offered the consumer it is practically useless to attempt to shut down his isolated plant. With such a substitute to offer much can be done. It is becoming more and more necessary that the central stations should be prepared to meet these conditions.

WHERE THE DECENTRALIZED PLANT IS MOST USEFUL

The decentralized plant is best adapted for use in the congested business portions of the city. In many business blocks there is as much demand for heat as is supplied by some central-station heating companies, whose business is spread over a very much larger area, necessitating the use of extensive mains, etc. The decentralized plant involves a comparatively small expenditure for steam mains, basement space being frequently available, and the transmission losses are correspondingly low. By careful design and judicious use of local advantages the conditions for the decentralized plant can be made very promising.

VALUABLE EXPERIENCE GAINED IN ELECTRICAL BUSINESS

In developing this line let us profit by the experience gained in the electrical business. Just as surely as the flat-rate system proved unsatisfactory for electric lighting, just so surely will it prove unsatisfactory for heating. A man is much more critical of what he receives from another, the quantity, the quality and general convenience, than of what he furnishes himself. Trivial deficiencies, which would pass unnoticed under his own supervision, become magnified to a tremendous importance when some one else is doing the work. Under a flat rate the natural tendency of a consumer is toward uneconomical use. He intends to get all that he can. Make it worth his while to economize, make it worth his while to co-operate, and the results will be much more satisfactory to all parties involved.

DECENTRALIZED PLANT NOT ADAPTED TO ALL CONDITIONS

In conclusion, let me say that the decentralized plant is not a universal panacea. It is not adapted to all conditions, but is eminently adapted to certain conditions. These conditions

I would briefly summarize somewhat as follows:

Install the plants in well built-up sections where the demand per unit of area is high. Operate these plants in conjunction with other condensing plants whose engines have a high thermal efficiency; the decentralized plant to be operated at a power load such that the exhaust steam will meet the heating requirements, any demand for power above this amount being carried by the condensing station. Tie all the stations together with a system of electric feeders, and tie adjacent decentralized plants together with a system of steam mains.

With a number of decentralized plants in operation, as warm weather approaches and the heating demand decreases, certain of the plants can be shut down and the district supplied from adjacent plants which are still in operation. This combination will give an economical load on the stations still operating, and the inter-connecting steam mains will have to be made only large enough to carry the light spring load.

During the summer the bulk of the power load will be carried by the condensing stations. The units installed in the decentralized plants should be designed to operate efficiently against a back pressure, and the sizes of individual units should be so chosen that, as the heating demands vary, each unit may be operated at or near its point of maximum efficiency. Special precautions should be taken to prevent the loss of heat, and every means available used to increase the boiler-room efficiency, for the boiler-room is the most important element of the plant.

DISCUSSION

MR. C. R. BISHOP: Mr. DeWolf's paper shows a very thoughtful study of a condition that is present in very many companies.

I have just completed eleven weeks' investigation of a similar condition of operation in one of the larger cities. I have taken in consideration the operation of twenty decentralized plants in connection with one compound condensing central station. After an investigation of twenty-eight isolated lighting, power and heat plants, we chose twenty of them as the best units to be used in connection with the idea. Eight of them for different reasons could not be considered at all. In a number of these twenty plants we found equipment of the highest class. The average size of the plants was about 200 H. P. Among them was a 700 H. P. plant, with economizers, ash conveying machinery, coal conveying machinery and mechanical stokers. The total firing cost was a trifle over $34,000. The firing and labor cost per ton was about $1.05. The central plant operated for less than 40 cents per ton. The entire amount of heating load could be carried for a trifle less than $14,000. The interest and depreciation on the investment and such costs did not begin to overcome the difference in the labor item alone.

The rumor was started about town that if this idea of decentralized operation were profitable to the central station, it was equally as profitable to the owner of the isolated plant, that with the same operation and same apparatus he could just as well take in a block system, and build up the same efficiency practically as a larger plant would.

One of the customers of the central station company got various manufacturing companies to make prices on apparatus needed for a certain quantity of lights, elevator service, and so forth, in his block. I was asked to go and see if I could get a renewal of a 10-year contract for light, heat and power with this customer and prevail upon him not to build this isolated plant. I took a map of the city on which was noted at the bottom of it the number of miles of roadbed operated in the city. I gave him the number of cars operated and the amount of horse power required, the number of commercial arcs and city arcs we were handling from the local station, the number of incandescent lamps; and took in the heating territory and showed him the square miles of heating district that was covered as against the square miles that were covered electrically. By doing that I was

able to show him the unbalanced power factor of an isolated plant. In a certain district of three or five square miles of heating territory, if he had a block 300 feet square, the amount of steam that he would get from the electric load, without any railway service at all, in the operation of lights and elevators in there would hardly heat the office in his own store. In carrying that down through the figures he was able to see that that was a fact.

MR. SPENCER: It seems to me that when Mr. DeWolf gets his system of decentralized plants, say twenty of them, and connects them all together, both in a steam way and in an electrical way, he has got a large district heating system different from those that we are accustomed to, simply in the fact that it is fed from a number of plants in place of one.

MR. BLY: In operating a block plant I have found that the coal handling was about 60 cents a ton, including the firing, etc.

MR. DEWOLF: Mr. Bishop speaks of twenty stations averaging up about 200 H. P. From our figures we have come to the conclusion that you could not operate a system of that kind on anything less than 350 H. P. When you get below you are going to lose money. These decentralized plants are not small 100 or 200 H. P. plants, such as an isolated plant would be, and you get enough load in them so that you can drop your coal handling cost somewhere near what you can get in a large station.

As regards the use of an isolated plant in a block system, the central station offers a reliability of service which the isolated plant cannot. The isolated plant will have an unbalanced electric and steam load. The central station can balance that up. We figured recently on one job: it was an industrial job where a certain manufacturing concerns had an isolated plant and they were doubling the capacity of their works. That isolated plant, as we figured it, would just about supply their heating requirements for their increased capacity and the question came up as to whether they were going to increase the size of their isolated plant and carry all of their power and plant load, or whether they would give it to us. They happened to be in a district where we could not get any more heating load.

We recommended that they operate that plant at such a load that the exhaust steam would just heat it; then take the balance of the power from us. We figured the thing out for them, and got the contract.

Mr. Spencer spoke of the decentralized plants being practically a large central heating station. We do not consider it as being such, because the steam mains do not tie all of the decentralized plants together, but only those which are adjacent, and we would not put in the extensive system of mains necessary for such a purpose. Of course the size of mains which would be required to tie two adjacent stations together would be much smaller than the mains required to furnish that district with all of the steam which it required from some other station situated some distance away.

PRESIDENT ROGERS: There is another point that appeals to me. Most of our cities are congested: our business district is limited: although it is growing, naturally. The value of the space either in a block system or an individual building down in the business district is relatively worth so much to that house in its regular line of business, that it is poor policy to fill it up with a power station, even though it is in the basement.

MR. BISHOP: Someone has asked whether this cost of $1.05 included anything else except firing. It did. It includes the cost of removing the ashes from the premises and various items of that kind.

As to the size of these plants, we did not start out with the idea of building twenty isolated plants of 200 H. P. complete. We were confronted with some forty plants operating. We took down only those of 200 H. P., or about that, and larger. There were twenty-eight of them and eight were eliminated on account of local conditions.

Heating and Ventilating a Ten-Story Bank Building

Boston Safe Deposit and Trust Co., Boston, Mass.

The latest addition to Boston's many fine bank buildings is the new ten-story structure of the Boston Safe Deposit and Trust Co. The building is on Franklin Street and extends from Devonshire to Arch Streets, with the main entrance of the bank on Franklin Street, and the office entrances on the two latter thoroughfares.

The system of heating and ventilation adopted in this building is a combination of the Webster "modulation" direct heating and an indirect fan heating system. Wherever possible the "modulation" system has been adapted to a direct-indirect system.

The bank building comprises a sub-basement, basement, main banking floor, mezzanine floor, and eight floors of rented offices. All the offices and corridors are heated by the direct system, while the banking department as well as the basements are on the indirect system.

The power plant, including the heating and ventilating apparatus, a laboratory and storage rooms occupy the sub-basement. In the basement is located the safe deposit department, including vaults, coupon room, etc. The main banking rooms and offices occupy the entire ground floor, excepting the part taken up by the main corridor, which is at the back of the building and runs entirely through from Devonshire to Arch Streets with an entrance on each street. Surrounding the main banking room is a mezzanine floor, upon which are located additional offices for the clerical force of the bank.

ARRANGEMENT OF VENTILATING APPARATUS

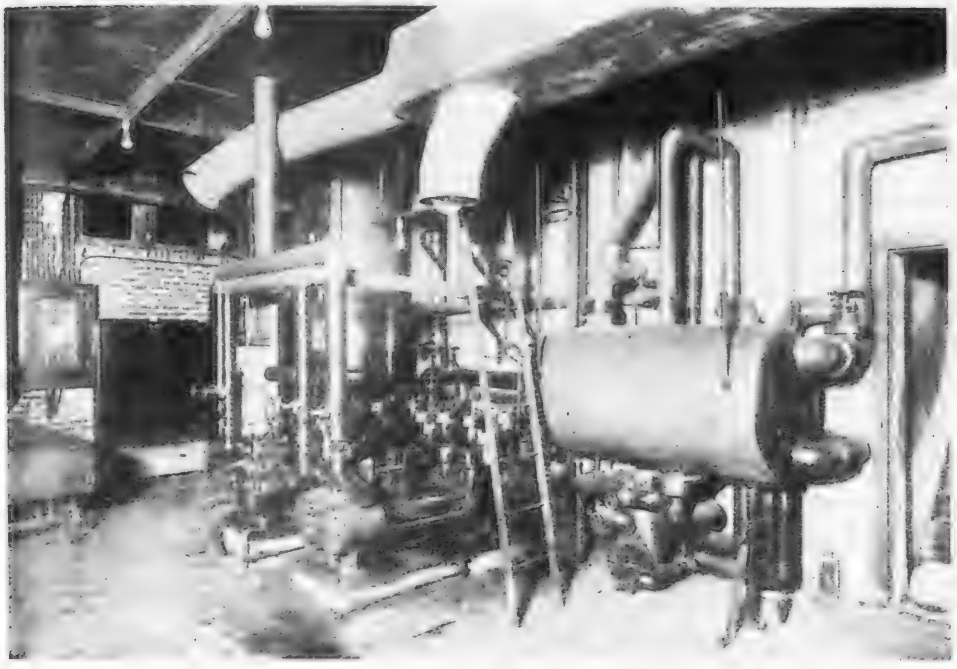
Fresh air for the main indirect system is taken in over the main doorway on the Devonshire Street side and is led through a brick downtake to the main supply duct, located under the sub-basement floor. This duct, which is of concrete, leads to an uptake through a floor grating into the main ventilating duct leading to a Webster air washer. From the washer the air goes to the main fan and is then distributed throughout the system. A primary heater, consisting of a tempering coil of 2,868 lin. ft. of 1-in. pipe, is located at the entrance to the air washer. Between the washer and the main fan is the main heater which is made up of 4,780 lin. ft. of 1-in. pipe set in two banks.

The dimensions of the air washer are 10 ft. 1½ in. by 11 ft. 2 in. wide.

BOSTON SAFE DEPOSIT AND TRUST CO.

Below the washer is a concrete tank which acts as a receiver for the spray water and a source of supply for the centrifugal circulating pump. The latter is a 2½ in. unit, belt driven by a 7½ H. P. motor and runs at 1500 R. P. M. The capacity of the washer is 40,000 cu. ft. per minute.

The main ventilating fan is a Sturtevant steel plate fan 108 in. in diameter and 54 in. in width. It is direct driven by a 25 H. P. Sturtevant



CORNER OF ENGINE ROOM, SHOWING FEED WATER PUMPS, BOSTON SAFE DEPOSIT CO.

motor which operates on 220 volts and is specified as capable of handling 4,520 cu. ft. of air at full speed. Two outlets are provided from the fan and galvanized iron ducts lead from them along the sub-basement ceiling to vertical risers at opposite ends of the building from which branches are taken to the different parts of the basement vaults, laboratory, mezzanine floor, and the main banking rooms. These ducts all end in register boxes of cast iron, the greater part of which are placed in the side walls and are located in such a manner to avoid any possibility of drafts upon the occupants.

A steel plate exhaust fan 84 in. in diameter and capable of handling 32,000 cu. ft. of air per minute is located upon the roof of the building for the purpose of abstracting the vitiated air from the banking floors through a series of galvanized iron ducts converging to a vertical brick riser. This fan is driven by a 13 H. P. motor, which is started and stopped from the engine room by means of remote control electrical starting device.

A secondary indirect system has been installed for the ventilation of the boiler, engine and pump rooms. A fresh air downtake similar to that of the main fan system supplies a 54 in. steel plate fan which has a capacity of 12,700 cu. ft. per minute, which is direct driven by a 6 H. P. motor running at 315 R. P. M.

Besides the indirect systems mentioned there is another exhaust fan system for the ventilation of the toilets, closets and lockers. These are in general vented through the fixtures to ducts leading to a vertical riser. The fan for this auxiliary system is located on the roof. It is a 36 in. steel plate fan capable of exhausting 5,220 cu. ft. of air per minute at 477 revolutions and is driven by a direct connected 2½ H. P. motor.

AIR COOLED 10° IN SUMMER

The operation of the indirect system and the air washer has been particularly successful in this installation and the impression upon entering the bank from the street is always of agreeable freshness and proper temperature. It has been a matter of considerable interest to the bank officials to personally determine how great an amount of cooling could be attained in hot

weather by means of the air washer and the results are reported to have been most satisfactory to all concerned. It has been possible to maintain the temperature in the bank 10° lower than obtained in the street during the past summer. In order to permit the system to work to best possible advantage all windows are kept closed and revolving doors exclude most of the air that would otherwise obtain admission from the street.

About 1 in. of mud is the usual amount taken from the ar washer each week which is disposed of by means of the flush-out valve provided.

DIRECT-INDIRECT SYSTEM FOR OFFICES

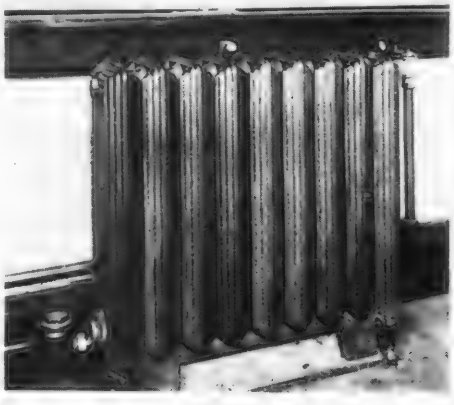
The "modulation" system of steam heating has been installed throughout the offices on the eight upper floors and the corridors. There are in all 320 radiators containing 11,960 sq. ft. of surface. In the corridors these are arranged for the usual type of direct heating but in almost all of the offices the plans provide for the use of the direct-indirect system. By this method fresh air intakes are provided in each room, a narrow slot 2 in. x 20 in. extending through the wall just beneath each window provided with a radiator. This small duct opens into a similar vertical duct leading down inside the plaster to the base-board whence a right angle turn brings the air out under the base of the radiator. A deflecting damper in the radiator base causes the incoming air to flow upward over the radiator coil. This damper is adjustable so that any degree of fresh air flow up to the capacity of the duct may be obtained. In addition to the deflecting dampers referred to, a shut-off damper is provided in the horizontal duct which is operated by means of a knob in the wall conveniently located just above the radiator. If desired, this damper may be closed and then the radiator operates as an ordinary direct heating unit.

By means of this system the occupant of each room is enabled to modulate the temperature to suit his own taste and the conditions of weather obtaining by an adjustment of the radiator valve.

During the past winter the pressure on the heating system was limited to ½-lb., even in the most severe weather. The system has operated satisfactorily under these conditions.

DESIGN FOR HEATING EQUIPMENT

Steam is generated in three Heine 153 H. P. boilers at 120 lbs. pressure which supply three American Ball engines driving the main generating sets, the pumps for the elevators, boiler feed pumps and various other auxiliary steam driven apparatus. These exhaust into a main 10-in. exhaust header from which two branches are taken to supply the respective heating systems—an 8-in. line to the tempering



RADIATOR ARRANGED FOR INDIRECT HEATING, WITH MODULATED CONTROL

coil and reheater of the indirect system and a 10-in. line for the direct system.

From the latter risers varying in size from 2 to 3 in. run to the top floor, the branches being taken off at each story to supply the radiators throughout that floor. Both low pressure heating mains are cross connected to the high pressure main supplying the engine through reducing valves in order that either or both heating systems may be supplied with low pressure live steam direct from the boilers in case of necessity.

The main 10-in. exhaust header, already referred to, terminates at one end in the feed water heater and at the

other end is connected to a 10-in. free exhaust pipe leading through a back pressure valve to the roof and surmounted by a Swartwout centrifugal exhaust head.

All risers are dripped back to a 4-in. main return line in the boiler room. The returns from the radiators, which are vertical pipes similar to the risers, carry the air and water of condensation to the main return, the air being vented to the atmosphere. The main return line extends to the automatic return tank which is in the boiler room just above the two steam driven boiler feed pumps and supplies the latter. From the indirect heaters—both the tempering coil and the reheater—a 3-in. return line brings the condensed steam to the automatic return tank also. In the tank is a ball float and valve which permits the entrance of make-up water. All risers and returns are fitted with expansion joints at a point about 7 ft. above the third floor, and are anchored to the steel framing of the building at two points.

Whenever the returns are carried on the walls above the water line they are sealed with an inverted loop. Concealed radiator piping was subjected to a consecutive twenty-four hours' test for tightness under 50 lbs. hydraulic pressure before being closed in.

The entire heating and ventilating system was designed and installed by Buerkel & Co., heating contractors, of Boston. The architects were Shepley, Rutan & Coolidge, of Boston. The "modulation" direct heating system and the air washer used in connection with the fan system were furnished by Warren Webster & Co., Camden, N. J. The fans, motors and indirect heaters are from the works of the B. F. Sturtevant Co., Hyde Park, Mass.

The Production of Peat

By L. B. Lincoln

In describing a new automatic movable peat plant before the American Peat Society at Ottawa, July 26, Mr. L. B. Lincoln included some instructive details regarding the process which peat undergoes in preparing it for use as fuel.

In view of the growing importance of this material as a substitute for coal, the conditions governing its production are of timely interest.

The plant, as described by Mr. Smith, is based essentially on the wet machine process in its most advanced form. It is a plant which excavates automatically its own peat from the bog, puts it through a macerating machine and delivers this peat pulp on top of the bog in an even layer, cut in rows longitudinally and also across, making the wet process block, which before drying is usually about 5x5x10 in.

The design which made such a mill possible was suggested by two facts:

1. In every wet process peat plant is a lot of track laying and track shifting or its equivalent, to get the peat to its drying ground and to keep the plant up to a working face.

2. This could be entirely and successfully done away with by supporting the mill on traveling aprons, *i.e.*, instead of wheels or broad rollers, a supporting device made up of wooden slats in the form of a continuous belt traveling around parallel axles on properly supporting wheels, the bottom side of which belt being kept rigid by proper guides.

With these two facts to work upon the first step was to construct a platform large enough to hold the motive power and a peat macerating mill, and also strong enough to withstand the shocks of a mechanical excavator tearing up large imbedded roots, or logs, etc., to make provision to give the supporting aprons any desired rate of travel and to make the steering of the device convenient. As it moved along, the next step naturally was to provide the peat, which was done by an entirely new bucket and chain excavator made of steel and sufficiently strong to withstand extra strain when roots

or logs are encountered in the peat.

The use of such an excavator has been made possible because the machine moves freely in any direction and thus can be kept up to a new working face continuously.

The transfer of the dug material from the excavator-discharge to the hopper of the peat mill necessitates a belt conveyor, and with this we have a machine delivering continuously a mass of peat properly prepared for spreading out to dry.

The machine could itself without introduction of hand labor spread this peat pulp directly behind itself and so entirely dispense with the so-called drying field, avoiding all apparatus and work necessary to spread at some distance from the machine. A new device has been designed for this purpose and also to cut the spread mass longitudinally; and another unique method was invented for the cutting crosswise. Now all that was left to be done was to house the whole suitably.

PEAT AS SPREAD OUT TO DRY

The question naturally arises: "What advantages can we expect from such arrangement of the wet process?" They are too numerous to detail, but, chiefly, this mill, with an output up to 6 tons per hour, requires only *two men* to operate it; namely, an engineer, who also steers the device, and the man who makes the fuel, *i.e.*, who controls the excavator, the peat mill and the spreading device. He can do that from a seat, as all controls are by levers situated at one place. Besides these two men there is a boy, who drags away the larger roots brought up by the excavator, and which is only necessary on bogs containing many roots.

Excepting the main ditch which drains the bog and which is economically and automatically done by this peat plant, no cross drains are necessary to prepare drying field, as the machine necessarily does its own draining and very efficiently at that.

The men are not exposed to the weather and can work continuously except in such heavy rains which injure the peat. On such days when a heavy downpour makes work impossible only two men are idle, instead of well on to a score.

The machine provides a very level

spreading ground, as it eliminates humps, hollows, etc., practically by its own weight, transferred to the bog surface through the flat bottoms of the supporting aprons.

How efficient these aprons are was shown at our first trial when the total weight of our machine rested upon and traveled over not only the ordinary surface of the bog, but also over a considerable strip which had been

PEAT MACHINE TRAVELLING AHEAD, SPREADING AND CROSS-CUTTING

cleared of all surface covering, exposing the soft sticky peat mud. On the very softest places the mill did not sink over two inches.

The motive power used at present is gasoline, but electricity will be introduced on the next machine built.

The greatest obstacle to be overcome in an automatic excavator for peat is that difficulty encountered from roots and logs buried in the bog and tendency of peat to adhere so tightly to any form of bucket that it would not discharge. These two obstacles have been successfully done away with by the new features of the excavator, which is of the "chain and bucket" type. The excavator is conveniently adapted to make any depth of ditch and so the quantity of peat necessary to keep the mill working harmoniously is easily adjusted.

From the discharge of the peat mill the pulp mass drops into a long narrow box, about at the center. This box is open at the top and has an opening along its rear side from which the peat is delivered in an even layer on the surface of the bog and directly behind the mill. The layer of peat in this box is kept uniform in thickness by right and left hand spiral conveyors.

The peat is now ready for the smoothing device, which, having a slight slope downwards and to the rear, presses the peat down to desired thickness and also smooths the surface of the peat mass already spread.

Just behind this smoothing device is a row of longitudinal cutting curves which cut the peat mass into parallel strips 5 inches wide, and immediately behind this is the cross-cutting device. This is not a reciprocating machine.

The knives are supported by a chain

moving continuously across the spread area and so arranged as to make a clean cut every 10 inches.

The whole machine is protected by a roof and by detachable sides. These sides are left off during the working season but can be quickly put in place, leaving the mill effectively housed and protected over winter.

"FULL STEAM—AHEAD"

OPERATION OF THE PLANT

The operation of the plant is as follows:

The bog is laid out, if possible, in a nearly rectangular area and divided by lines 100 feet apart. The peat mill moves down one of these lines, excavating a ditch along this line the required depth to fill the spreading box. The excavator is hung out over the side of the platform and therefore cuts its ditch parallel to the spread peat mass and a short distance away from it. When the ditch has been dug the full length of the first line the excavator, spreading box and cutting knives are completely lifted by a lever and the machine is quickly turned around under its own power, and it now returns, making the ditch twice as wide and spreading the dug material on the other side. This ditch is then left until the peat spread has become fit for fuel. This fuel will be removed before the machine comes back to the point from which it started, when it increases the width of the ditch by a cut, down one side and up to the other, again spreading in the manner described.

While the peat is drying at the first ditch, a second and third ditch and so on are made until a working area has been provided so large that before the plant has reached the far side of the bog the peat on the first ditch has been removed and the operation becomes continuous. When the bog is exhausted, or when for any other reason it is desired to move the machine, all that is necessary is to raise the excavator, the spreading and cutting devices, close up the house and start out across the country to another property, over the softest ground if necessary, or on an inclined platform up to a car, on which the machine will be loaded in a very short time.

The plant is complete in itself and no other buildings or equipments are necessary.

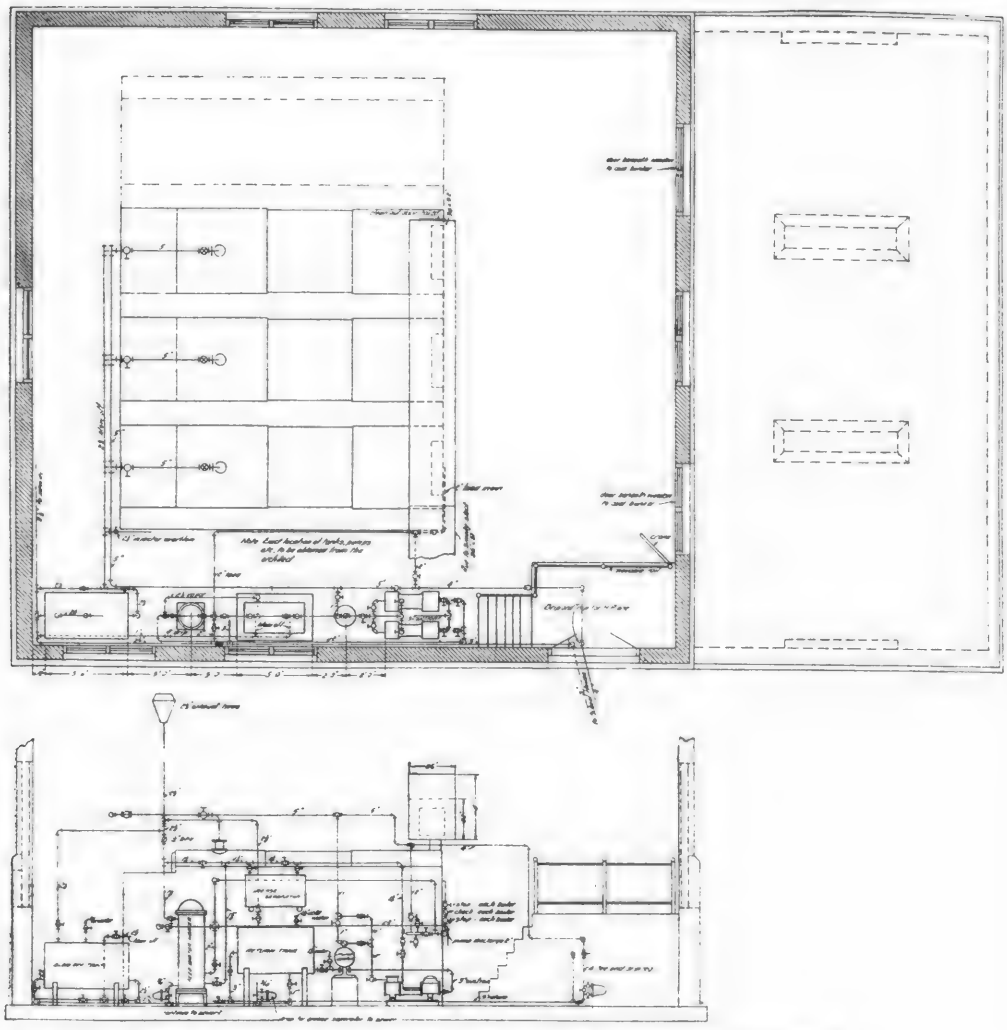
Mechanical Plant for State Normal School, Montclair Heights, N. J.

The State Normal School at Montclair Heights, N. J., is one of the most important school buildings erected in New Jersey since the present school house ventilation law went into effect. The heating and ventilating equipment is of special interest in that the ventilation is provided by ample quantities of tempered air with direct coils or radiators to balance the heat transmitted by the walls and windows in contrast to the practice of relying upon the incoming air to heat the building. In the Montclair School gravity vents without aspirating coils are used to carry off the foul air except for the toilet and locker rooms for which an attic exhaust fan is provided.

The school is located on a commanding site and is but the beginning of what is expected will be a large group of buildings and it is for this reason that an independent boiler plant was considered advisable. The school has been running for two years and the fact that the heating plant has fulfilled very expectation under the prevailing conditions adds much to its interest. The president of the New Jersey State Board of Education, Mr. Edward Russ, stated in a letter to this journal, "for the two winters that the plant has been in operation, it has given absolute satisfaction, with no fault to be found in it whatever."

The boiler plant is located in a separate boiler house about 350 ft. from the school building, a 4-in. high pressure steam and 3-in. return line being run in underground between the

STATE NORMAL SCHOOL BUILDING, MONTCLAIR HEIGHTS, N. J.



BOILER HOUSE, STATE NORMAL SCHOOL, MONTCLAIR HEIGHTS, N. J.

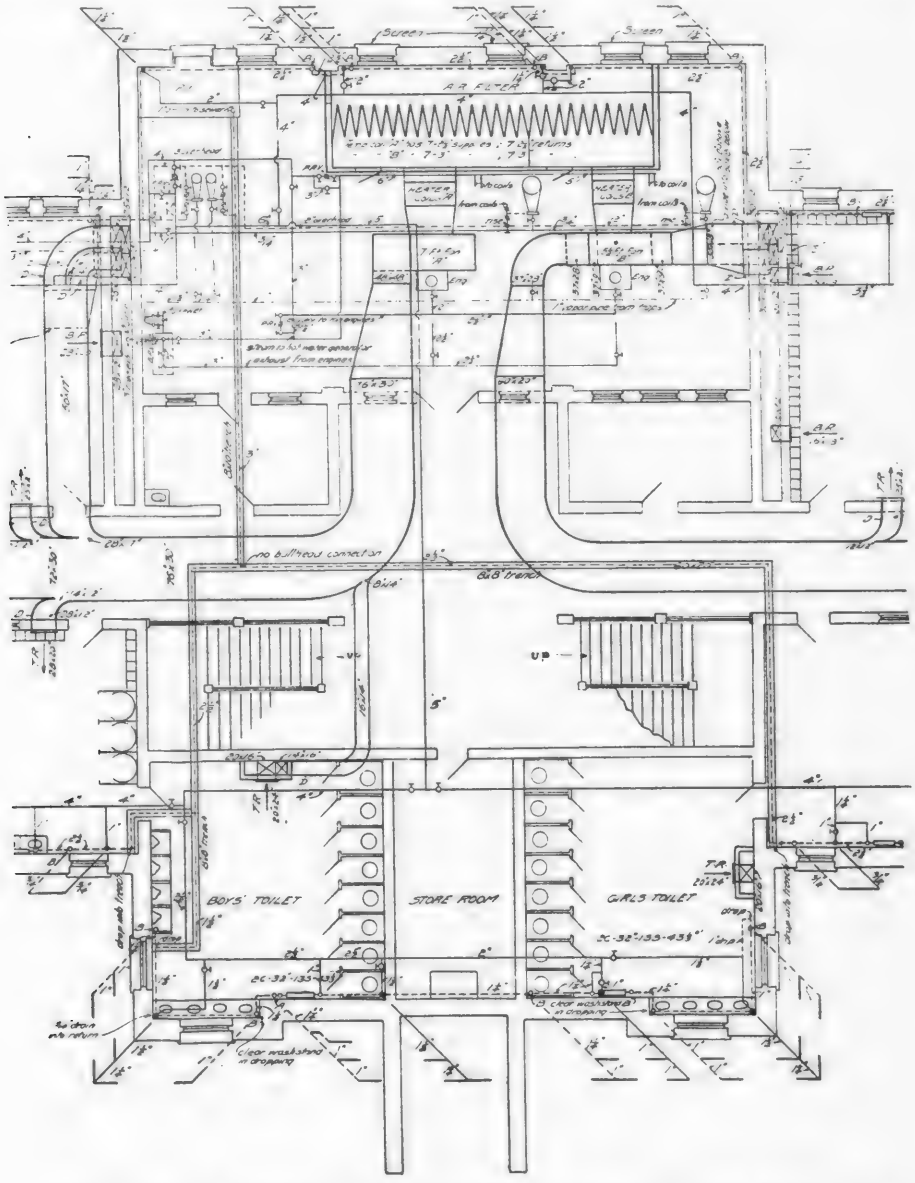
buildings. The 4 in. steam line is carried to a central point in the basement of the school building where connections are taken off for the fan engines and pumping traps and through pressure reducing valves to the heating system, air tempering coils and hot water generator. The high cost of operating blowers by means of motors led to the employment of engine-driven blowers so arranged that the exhaust steam from the engines after passing through a utility grease separator can be used in the air tempering coils, or by-passed through a free exhaust to the atmosphere. The returns from the heating system and tempering coils are delivered through independent Bundy pumping traps to a return tank in the boiler house. From the return tank there is a connection through a pump governor to the boiler feed pumps which deliver the water to the boilers through a grease separator and a Wainwright closed type feed water heater to the boilers.

The two boilers are 80 H. P. boilers of the return tubular type made by Samuel Smith & Sons, Paterson, N. J. Two of the boilers are of sufficient capacity to heat and ventilate the school building in the severest weather. Space has also been allowed in the boiler house for two additional boilers to be installed in future time

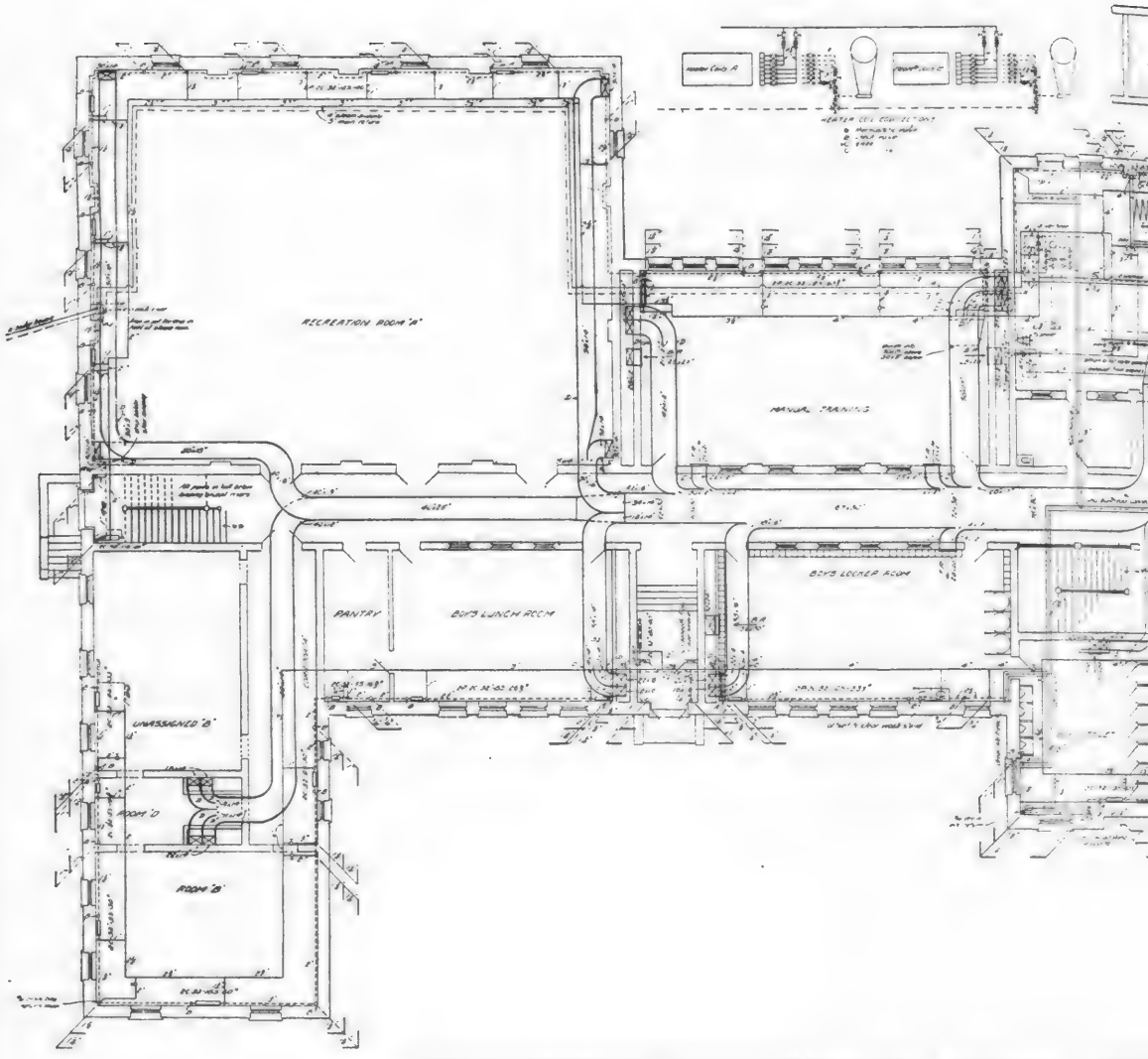
when additional buildings may be constructed.

BLOWER SYSTEM

The air for ventilating purposes is supplied by two blowers located in the basement near the center of the building. The blowers are steam driven by direct connected vertical acting engines. Fan A which supplies air to the west end of the building has a wheel 7 ft. in diameter with curved blades 4 ft. wide. Fan B supplying the east end of the building has a 5½ ft. wheel with 3 ft. blades. Steam is supplied to the engines at 70 lbs. pressure. The exhaust fan in the roof space of the building, which, as stated, extracts the air from the toilet and locker rooms is 72 in. in diameter, of the Howard and Morse duplex cone type, driven by a vertical direct connected 4 H. P. electric motor.



PART PLAN OF BASEMENT, STATE NORMAL SCHOOL, MONTCLAIR HEIGHTS, N. J.
(See pp. 20-21.)

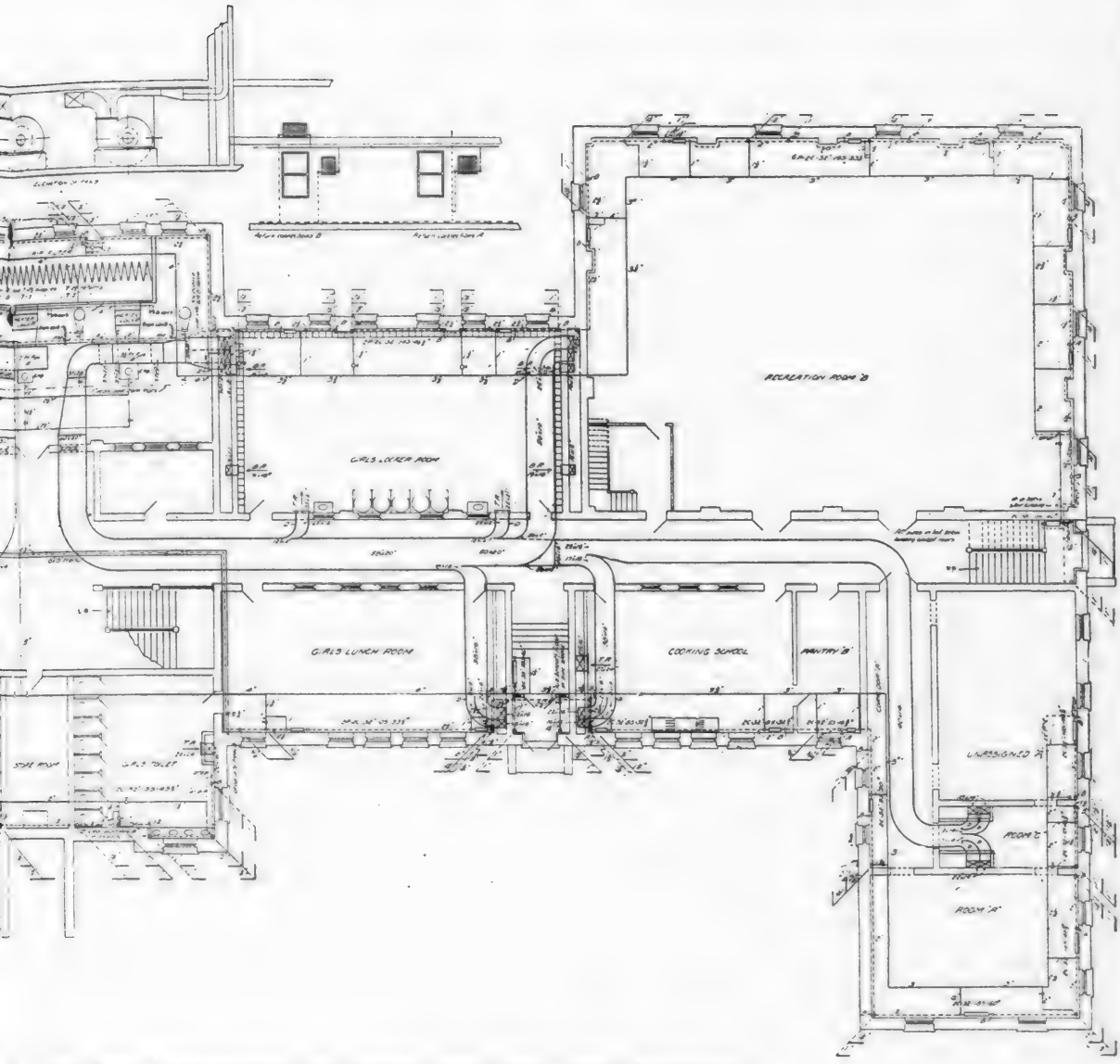


PLAN OF BASEMENT, STATE NORMAL SCHOOL, MONTCLAIR HEIGHTS

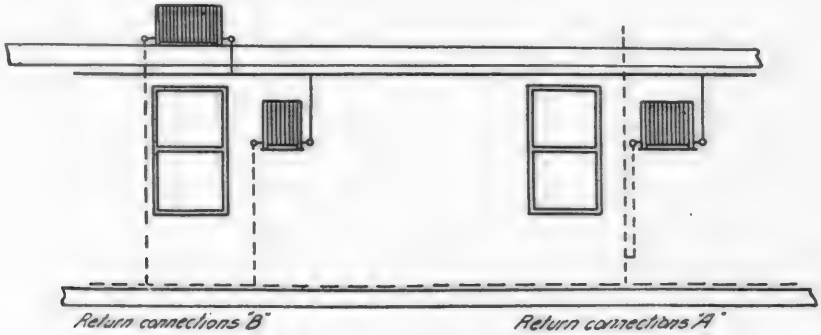
The tempering coils are of the mitre type. The coil for fan A contains 3,143 lin. ft. of 1 in. pipe divided into seven sections each two rows deep. Coil B is similarly arranged and contains 1,904 lin. ft. of 1 in. pipe.

The entire heating and ventilating system is under thermostatic control, the Johnson Service system being used. Twenty-three rooms on the first floor and 17 rooms on the second floor have thermostats, while in the basement one is connected to the hot water generator and four to the tempering coils. In the latter case one thermostat located in the cold air chamber controls the first three groups of pipe in each tempering coil, and a second thermostat located in the fan discharge duct controls the remaining four groups.

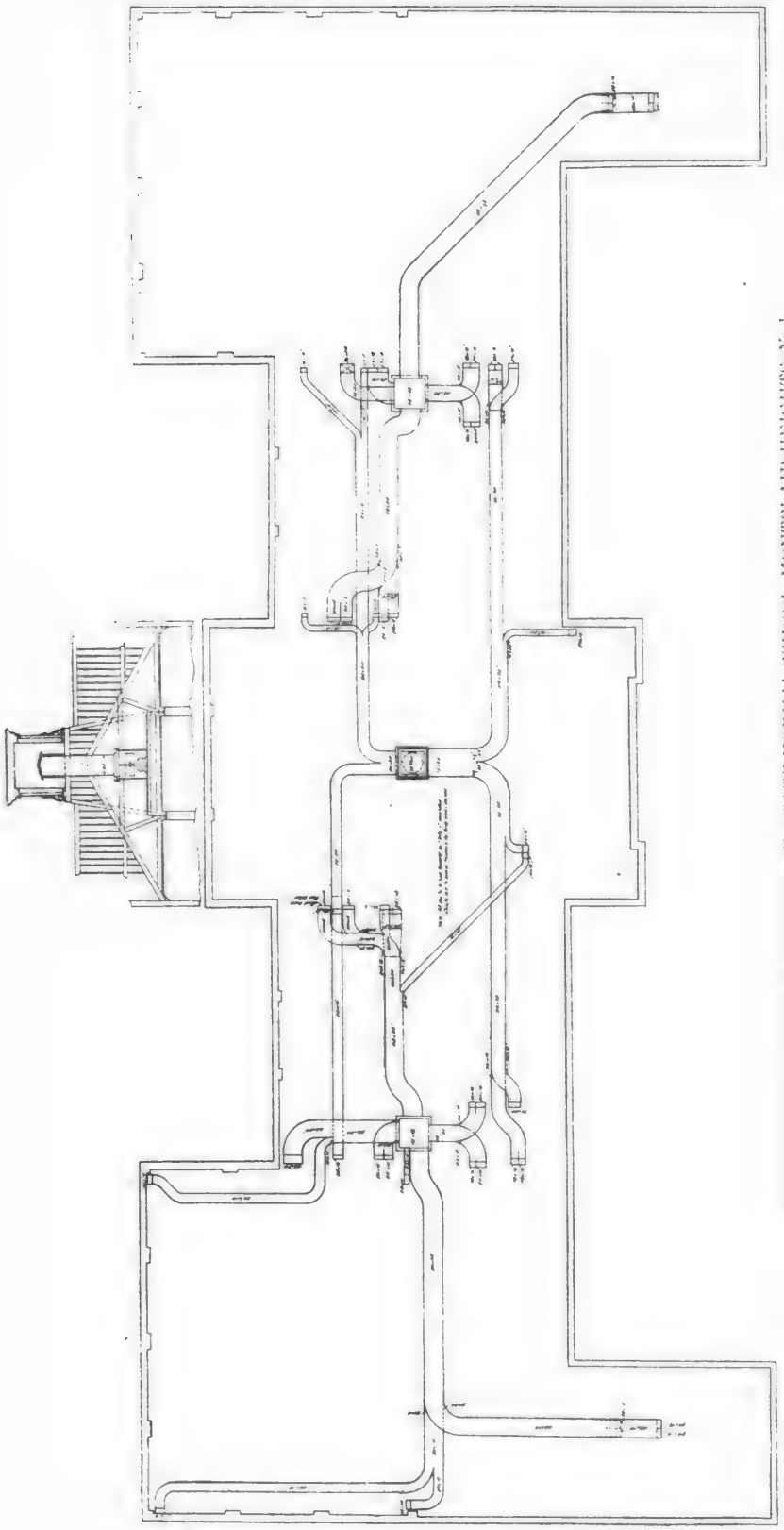
The building contains a total of 6,900 sq. ft. of direct radiation, and additional 12,600 sq. ft. in the tempering coils. The school buildings were designed by Mr. George E. Poole, State Architect. The heating and ventilating equipment was de-



N. J., SHOWING ARRANGEMENT OF HEATING AND VENTILATING APPARATUS



DETAIL OF RETURN CONNECTIONS SHOWN IN ABOVE PLAN

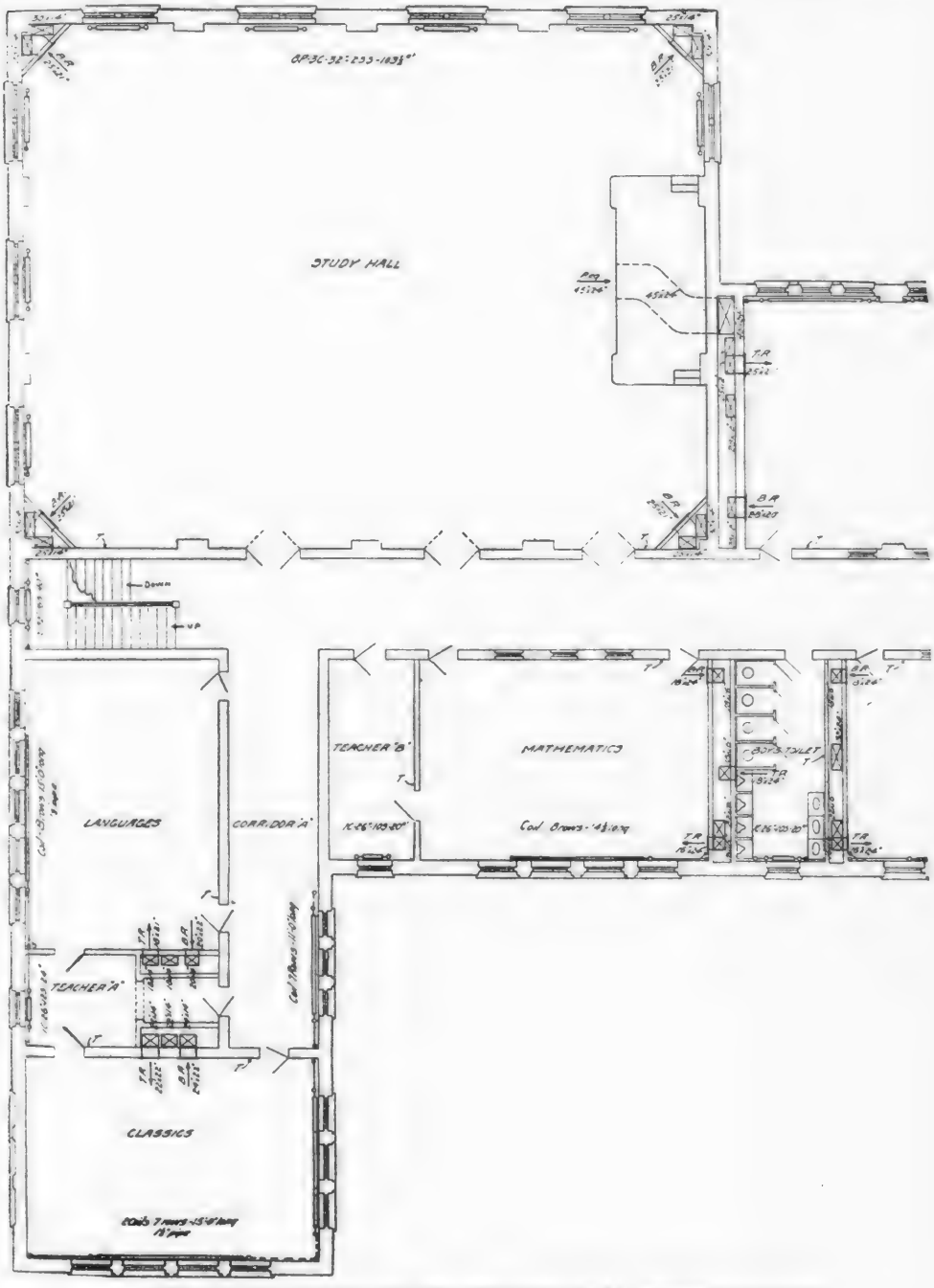


PLAN OF DUCT WORK IN ROOF SPACE, STATE NORMAL SCHOOL, MONTCLAIR HEIGHTS, N. J.

signed by Mr. Harry C. Meyer, Jr., consulting engineer, New York, and installed by the Fentzlaff Heating Company, New York.

An Early Air Washing Installation

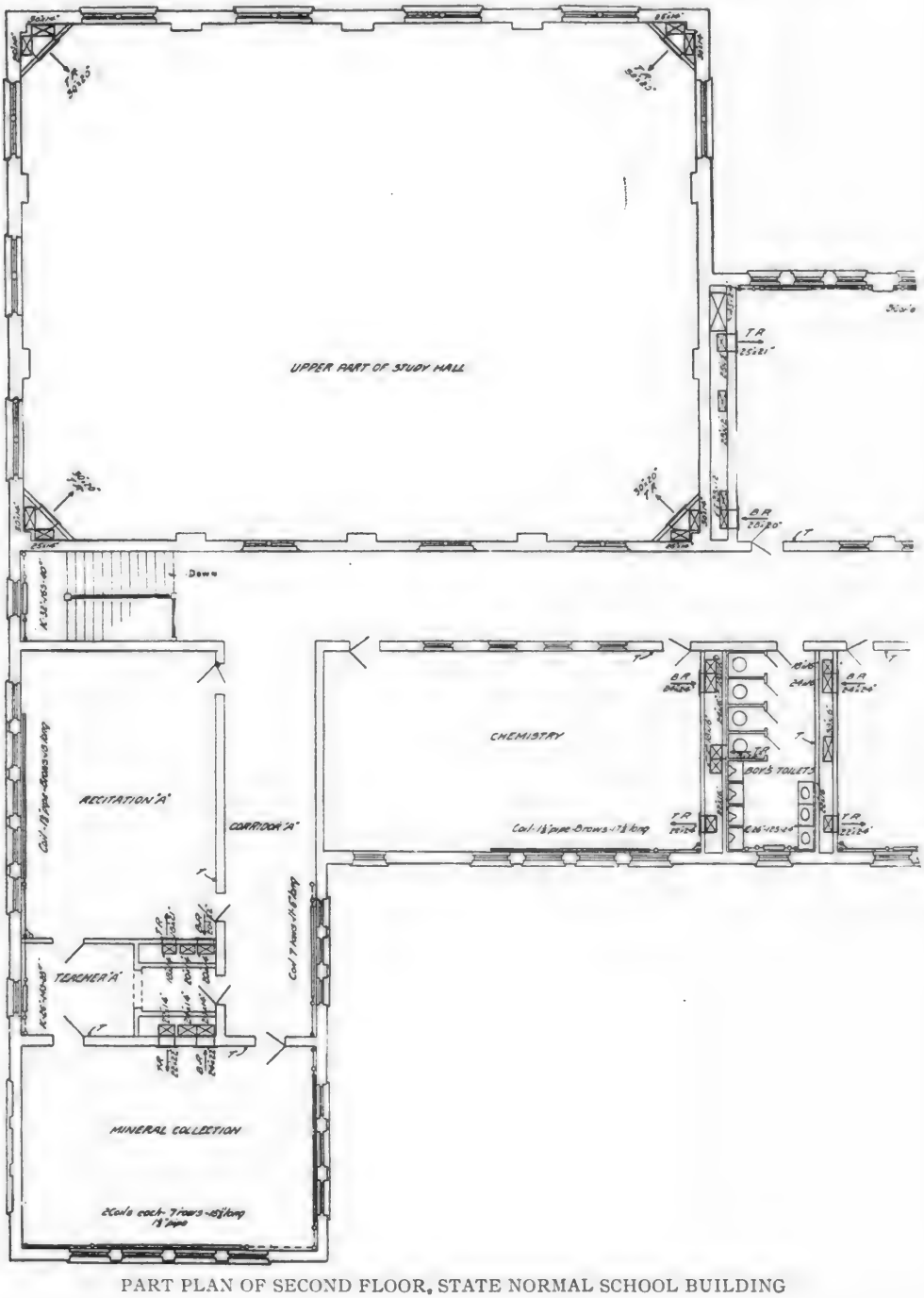
What is believed to be the first installation of the present type of air washer was made in 1900 in the Chicago Public Library. In view of the fact that but ten years separate that time from the present a curious interest attaches to a description of this particular installation which was printed in the *Chicago Chronicle* for September 25, 1900. It reads:



PART PLAN OF FIRST FLOOR, STATE NORMAL SCHOOL BUILDING

AIR IN LIBRARY IS WASHED

Washing air of the Chicago Public Library was given a successful demonstration yesterday and two additional atmospheric manglers are being put in place that will cleanse the breathing supply for the entire building. Employees, patrons and visitors to the institute will shortly be inhaling air more pure than that which rustles through the woodland and sweeps over the prairie. The atmosphere of the down-town district has gone through the mangler and lost



PART PLAN OF SECOND FLOOR, STATE NORMAL SCHOOL BUILDING

its many scents along with its soot and dirt.

Pure as from Nature's laboratory, it has filled every nook and corner of the broad and altitudinal reading-room. The dust and dirt that mingles with the air are destructive to the mural decorations and the books in the library and the cleansing machinery is introduced from motives of economy and from desire to preserve rare and valuable works rather than from any disposition to furnish a health-giving atmosphere to the public.

The benefits to mankind are incidental to the money side of the undertaking.

Smoking chimneys have sent their clouds of dust rolling over the library building and spread a film of impalpable dust over the polished marble and the many colored mosaics of the wall.

The success of the plant is established. The three shafts are equipped with washing devices, which are accomplishing more than expected. As the wind shifted the building has been permeated with different kinds of odors. The coffee-roasting establishments on the north have sent the aroma of the curing beans into every nook and cranny.

Spice mills have made the air heavy with their aromatic scents, and up from the alleys of the first ward came the pungency of decaying vegetables. All these are lost in the washing devices. The amount of dirt in the down-town atmosphere is almost incredible. The washer has shown its quality.

All of the heavy particles that are flying about the atmosphere fall to the bottom of the shaft with the weight of the water they absorb. Shavings, soot, paper, straw, filaments of cotton and wool float away with the water into the drain.

The water-soaked air strikes the plates of the eliminator and slips along the surface to the flange and is deflected back against the opposite plate in the row on the reverse side from its flange. It passes to the next row of plates set at another angle, so it runs through the series of plates and makes more turns and deflections than a football player trying to steal goal.

The moisture adheres to the plates, taking the dirt with it. In a distance of three feet through the box the air pours out, cooled by the spray, but dry. There is an open gallery of five feet, and on the other side are steam coils to heat the air in winter. Not a particle of moisture appears on the pipes.

If a hand is inserted through the narrow apertures between the plates, it becomes as black as if it had been dipped into a street puddle. In the flanges the dirt is thick and oozes down to the bottom of the box with the dripping water and flows from the bottom, which is on an incline, into the drain.

Once or twice a week a workman goes into the mangler and turns a stream of water into the eliminator and washes down all the accumulated dirt. Mr. Jacob Reitz, chief engineer, has watched the work of the air washer for several months. He says it is perfect in its work. On his recommendation the other shafts were equipped with like washers.

More air will be pumped through the building this winter than formerly.

The washer used in this instance was the Acme, made by Thomas & Smith, of Chicago.

Reported Purchase of Model Heating Company by McCrum-Howell Company

An important change in the heating trade is reported in the sale of the business of the Model Heating Company, of Philadelphia and New York, to the McCrum-Howell Company, of New York. The Model Heating Company was established about 15 years ago and among the principal stockholders are A. E. Pfahler, of Philadelphia, and P. H. Seward, of New York. Mr. Pfahler, it is expected, will retire from the heating business, while Mr. Seward, according to the same source of information, will become associated with the McCrum-Howell Company.

THE HEATING AND VENTILATING MAGAZINE

Vol. 7 October, 1910 No. 10

PUBLISHED MONTHLY AT
1123 BROADWAY, NEW YORK
BY THE
HEATING AND VENTILATING MAGAZINE CO.
President A. S. ARMAGNAC
Secretary and Treasurer, G. PETERSEN
The address of the officers is the address of this magazine.

A. S. ARMAGNAC, Editor — G. PETERSEN, Advertising Mgr.

European Representative:
AMERICAN PUBLICATION BUREAU, 46, Upingham Road, Leicester, England

Subscription, - - - - - $1.00 per year
Foreign countries, - - - - 1.50 " "
Back numbers, - - - - - 15 cents a copy

A SIGNIFICANT action was taken at the recent annual convention of the Canadian master plumbers when a motion was made to change the name of the organization to the Canadian Society of Sanitary and Heating Engineers. The fact that it was referred to the incoming executive committee, after receiving the endorsement of the resolutions committee, would indicate that the idea finds considerable support among Canadian plumbers. The argument was made that the master plumber of to-day does far different work from his predecessor of a generation or two ago. Instead of being a worker in lead, as the word "plumber" signifies, he is a man of science, having as much, if not more, to do with the sanitary condition of the community than the medical profession.

Admitting the force of this argument, it is difficult to see why the master plumber should desire the appellation of "heating engineer." In this country we already have master plumbers and sanitary engineers in the plumbing field and master steam fitters and heating and ventilating engineers in the heating field. The two lines are thus conveniently and accurately designated and the proper distinctions made.

With the growth of the two industries their convergence is no less distinctly marked than their divergence. While many master plumbers continue to do steam fitting, and *vice versa*, it is nevertheless true that each industry has a field sufficiently large to attract the best and undivided efforts of those engaged in it, and the tendency is all in that direction. Moreover, the accepted definition of a heating engineer, nowadays, implies knowledge of many features of mechanical engineering, such as those involved in the mechanical equipment of buildings, as well as those connected with central station work, that are quite foreign to the training of the ordinary master plumber.

Thus the movement appears to be distinctly reactionary and one calculated to introduce an entirely unnecessary confusion in the commonly-accepted meaning of the term "heating engineer."

WITH the November issue we shall resume the publication of the monthly weather charts for five representative American cities, which have been a feature of this magazine for a number of years. The first charts will show the weather conditions during the present month of October.

A Method of Heating With Waste Heat from Gas Engines

A method of saving 60 per cent. of the total heat in the fuel used with gas engines, all of which can be utilized for warming purposes, is proposed by Prof. John T. Faig, of the mechanical engineering department of the University of Cincinnati. Prof. Faig's ideas were presented at the recent meeting in Cincinnati of the National Gas and Gasoline Engines Trades Association. He stated that two sources of great heat waste occur in internal combustion engines. This waste is so common that there is danger of losing sight of its importance. The two sources are the jacket water and the exhaust. The amount of heat so lost varies in different engines, but is nearly always three times as great as the amount converted into work in the cylinder.

The accompanying table shows the percentages of heat of the fuel lost in some engines:

Fuel	Name of Engine	Rated Brake H.P.	Heat Converted into Work in Cylinder Per Cent	Heat Lost in Jacket Water, Exhaust and Radiation Per Cent	Reference
Illum. Gas	Gueldner	20	42.7	57.3	Test by Schroeter Z. d. v. d. I. 1904
Nat. Gas	Walrath	75	27.1	72.9	Geer and Venelain Sib. Coll. Thesis. 1902
Prod. Gas	R. D. Wood	300	24.4	75.6	Goldsmith and Hartwig Sib. Coll. Thesis. 1905
Kerosene	Hornsby	25	21.0	79.0	Robinson, 1908 Gas and Pet. Eng., p. 710
Prod. Gas	Fair. Morse.	25	25.8	74.2	Jahnke Univ. Cin. Thesis. 1910

Except for the Gueldner engine, which gave such remarkable economy as to be exceptional, the tests showed that about one-fourth of the heat of the fuel was represented by the indicated horsepower. Practically all the remaining three-fourths of the heat of the fuel was lost in the jacket water and exhaust.

As these tests were made on engines in good condition, and were considered good enough to go on record, there can be no doubt that the losses of heat in the jacket water and exhaust for everyday engines will be considerably greater.

Beside the losses already mentioned, there may be mentioned the mechanical friction of the engine and the radiation, which are inevitable, and constitute together not more than 5% of the heat of the fuel. The mechanical friction is, of course, included in the indicated horsepower.

Not only is the heat of the jacket water lost in most cases, but its removal entails considerable expense, that is, the cost of the jacket water itself. There are, it is true, some few installations where the jacket water is used for heating or industrial purposes, but such installations are merely exceptions to the general run of plants.

The development of auxiliaries that will utilize the heat of the jacket water and exhaust gases must keep pace with the development of internal combustion engines if these engines are to compete with steam engines where the exhaust is used. Where hot water for heating or industrial purposes is required the utilization of most of this waste heat presents no great difficulty.

Fig. 1 represents a diagrammatic sketch of an engine with two simple heat interchangers, one using the jacket water and the other the exhaust gases. The jacket water is used over and over. The water to be heated must have sufficient pressure to over-

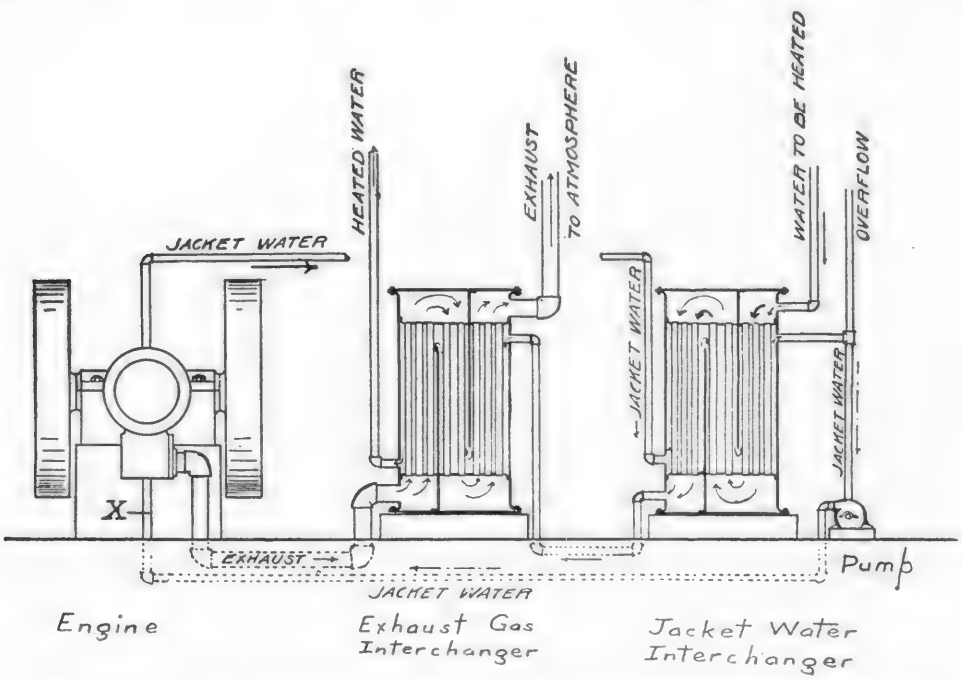


FIG. 1—SKETCH OF ARRANGEMENT FOR UTILIZING WASTE HEAT FROM GAS ENGINE

come friction of passage through the interchangers.

The sketch is purely diagramatic, to show the circulation of the jacket water, exhaust gases and water to be heated through the interchangers. The same idea may be expressed in many different designs. There is no reason why one interchanger should not be placed on top of the other, or the two combined in the same shell. One form of interchanger has recently been put upon the market. Some firms use part of the heat of the exhaust for vaporization of water for the producer.

The writer has given some attention to the utilization of waste heat from producer-engine plants and prepared sketches for a plant utilizing practically all of the heat in the coal, except the inevitable losses of hot ash, mechanical friction and radiation, all of which may be reduced to very small percentages of the total. These sketches will not be presented at this time, as they would apply only to producer plants, while the sketches shown apply to all plants using internal combustion engines.

The interchangers may be of the

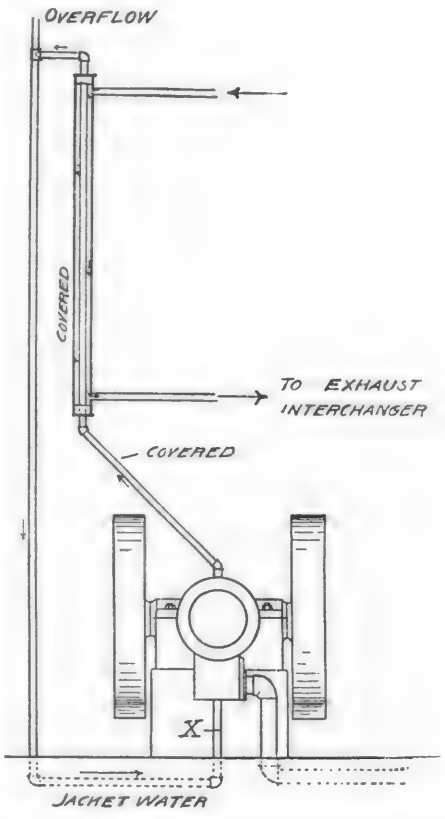


FIG. 2—ARRANGEMENT WHEN CIRCULATING PUMP IS ELIMINATED

simplest construction, since all pressures are small and temperatures comparatively low, the highest being that of the exhaust gases, from 600° to 1,000° F. A thermostatic valve could be installed at X (Fig. 1) to automatically admit cold water from the city mains should the temperature at X rise too high. This might occur if for any reason the circulation of the

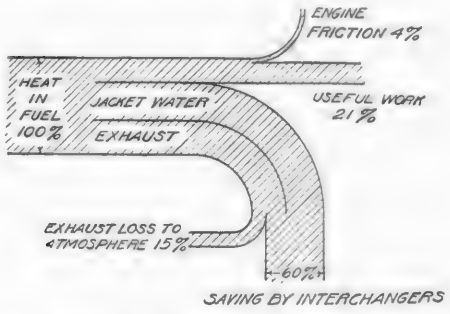


FIG. 3—CHART SHOWING DISTRIBUTION OF HEAT IN AN AVERAGE INTERNAL COMBUSTION ENGINE

water being heated should be stopped. The exhaust gas interchanger should form an excellent muffler. The exhaust pipe between the engine and interchanger should be covered to reduce heat loss, maintain a reasonable temperature near the engine and prevent burnt hands.

Fig. 2 shows an arrangement which does away with the necessity for a circulating pump in the jacket water line. A thermostat controls the admission of cold water to the jacket water line and will operate if for any reason the interchanger does not absorb sufficient heat from the jacket water. The jacket water interchanger may be secured against a wall overhead to save space if there is sufficient head room. The height which will give the proper circulation for a given engine could probably be determined only by trial.

Fig. 3 shows the distribution of heat in an average internal combustion engine, showing the percentage of useful work obtained and the amount taken up in friction, exhaust and jacket water, with probable saving by the use of interchangers.

Current Heating and Ventilating Literature

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

MECHANICAL EQUIPMENT. — Electrical and Mechanical Installation in the Blackstone Hotel. Illustrated description of the electrical equipment for a Chicago hotel. 3500 w. Elec Rev, N Y —Aug. 20, 1910. 10c.

SHOP HEATING.—The Heating of Engineering Shops. Illustrates and describes the heating apparatus installed in the shops of the Central London Railway. 1500 w. Engng—Aug. 19, 1910. 40c.

STEAM PIPES.—Water in Steam May Cause Trouble. W. H. Booth. Describes the action of water in steam and suggests how it may be avoided. 1200 w. Power —Aug. 23, 1910. 10c.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Date Named for Annual Meeting

At a meeting of the Board of Governors of the American Society of Heating and Ventilating Engineers, it was decided to hold the annual meeting of the society in the Engineering Societies' Building, 39 West 39th St., New York, January 24, 25 and 26, 1911.

Some Ideas on Heating

Discussing the merits and defects of the warm air furnace before the recent semi-annual meeting of the Heating Engineers' Society, the well-known claim that the warm air furnace leaks gas into the air supply pipes was answered by Mr. W. W. Macon, who stated that, in his opinion, during the greater period of time in which a furnace is in operation, the tendency of the movement of gases would be inward into the combustion chamber. When the temperature of the smoke pipe is much greater than that in the air flues and the draft in the smoke flue is, therefore, greater, the pressure in the combustion chamber is lower than the pressure in the warm air passages. Thus any leakage of gas would pass up the chimney, except at times of firing.

Discussing the general subject of heat transmission, Mr. Macon said:

"According to a chemical engineer of Warsaw, Poland, each particle of dust that floats in the air becomes wrapped

in a thin coating of moisture and that vapor acts as an insulating medium when the dust particles reach the heating surface. On this account the heating surfaces do not thoroughly consume the dust particles. When air laden with dust from wool fiber, clothing or street débris, comes into contact with the heating surface, we have an organic compound such as acrilin, which is decidedly irritating to the mucous membrane. Another idea advanced by this engineer is that we should not send our air over the heating surfaces in thin sheets, as this tends to heat portions of the air supply to an excessive temperature."

Mr. S. R. Lewis, speaking of the use of air washers or any automatic means of humidifying the air, said that it was necessary to install considerably more heating surface to take care of the evaporation. "I have had instances," he said, "where there was close figuring on a job and a humidostat was put in without increasing the size of heating apparatus. It was then necessary to add to the heating apparatus on account of the humidostat."

Mr. Jas. Mackay: I have noticed that when a shell is taken off a furnace, there is at times over half an inch of fine white soot or ashes collected all over the inner surface. In this way the size of the smoke outlet is reduced, resulting in leakage of carbon dioxide.

Mr. Thomas Morrin: The leakage of gas from a furnace is a question of expansion and contraction. We all know that we have never been able to construct a fire-box boiler that is not more or less affected by unequal expansion and contraction. The hot air furnace is no more exempt from that than the steam boiler, but it is less noticeable. You can use what putty you will, you can rivet the joints, but I have yet to see a furnace that has remained tight for a period of six months. When I say tight, I mean perfectly tight.

Dr. W. F. Colbert: The white fuzz on the outside of the furnace that was mentioned is not due to leakage from the combustion chamber, but is due to partial incineration of the dust particles. You will find that white fuzz on the cast-iron furnace more pronounced than you will on the smooth steel furnace because the rough surface of the cast-iron furnace tends to the collection of these particles. I grant you that with steam radiation you do not find that incinerated dust. But from the standpoint of a physician I question which is the more harmful, the small percentage of gas given off from incineration or the actual dust itself? In the one case you have a slight effect from the gas, in the other you have a deposit of dust in the lungs and dust that gets into the lungs is never exhaled, except a very small portion. It is deposited in the air cells and tends to the inoculation of the bacillus tuberculosis, which usually enters the body by these channels.

I wish to state that I believe it is possible to so pack the joints of a warm air furnace that they will not leak gas.

Mr. James Mackay: I aggree with Dr Colton that joints in warm air furnaces may be made and are made and have been made so that they last twenty and even forty years and resist the passage of gas, always provided, however, that they are not overheated. There is the point. When furnaces leak gas it is generally because they lack sufficient heating surface and are overheated.

Acoustics and Ventilation

The following is taken from a discussion before the Heating Engineers' Society:

Prof. J. H. Kinealy: I have had occasion to look into the question of interference of ventilating apparatus with the acoustics of audience halls. In one case the air was supplied to the hall from openings just in front of and under the stage. In the other case, a large part of the air was supplied through the floor upwards, directly in front of the stage. But in neither case did the entering air in any way affect the acoustics of the hall. They were, as far as I could tell, exactly the same, whether the ventilating system was running or not. I have yet to find a hall where the acoustics have been interfered with by the supply of air for ventilating purposes.

Mr. W. W. Macon: Prof. Sabine, Harvard University, states that, as a result of some tests, a heated column of air has interfered with the proper transmission of sound. He says that it is altogether unnecessary to attempt to move the air in the direction in which the voice or the sound is supposed to carry, that the sound travels rapidly, about 1,000 ft. per second, and if we were to try to ventilate this auditorium and attempt to push the air all forward from the stage at perhaps 10 ft. per second, we would find that during the time in which the air would travel ⅛ in., the sound would reach the rear of the hall, so we would not have the effect of being intercepted by the air. He also states that a higher temperature of the air in the upper part of an auditorium has a tendency to force the sound waves downward.

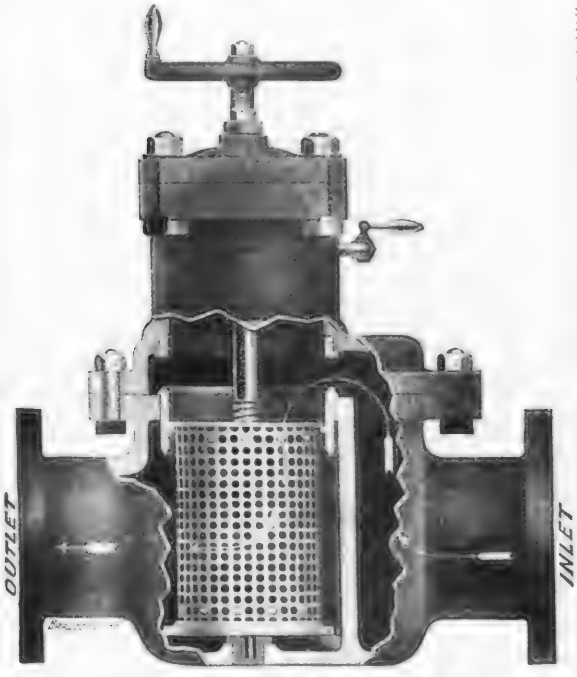
Mr. John F. Hale: Some years ago I was working on a plan for heating a theater and I located two radiators in front of the stage. When I submitted my drawings to the architect, I received a lecture on the acoustic properties of a theater, the architect stating that the heat rising from the radiators in front of the stage would form a curtain be-

tween the people on the stage and the audience and interfere with the carrying of sound. He stated at that time that the best practice was to admit the air on the sides of the stage and arrange the ventilating system so that the movement of the air would be toward the audience.

NEW DEVICES

A Multiple Water Strainer

Solid foreign matter in water, such as ice, rocks, sticks and leaves, has wrecked many pumps. It has stripped the blades from centrifugal pumps and put the valves of reciprocating pumps out of business many times. Even when such solid matter has gotten past the pumps without doing severe damage it finds its



SIDE VIEW OF MULTIPLE STRAINER

way into surface condensers and boilers, causing untold trouble.

Nearly all sources of water supply, especially for circulating water, contain an immense amount of suspended matter, and while attempts are often made to remove this by placing a strainer around the suction pipe foot valve, this only transfers the source of trouble. The strainer soon becomes clogged and it is necessary to shut off the pumps while it is being cleaned. If the water is being used for condensers this means the loss of the vacuum and throwing an extra load upon the power equipment of the plant. If there is no reserve power, it means shutting down the plant.

In order to overcome these difficulties, the Lagonda Manufacturing Company, of Springfield, Ohio, has recently perfected a multiple strainer for removing impurities in feed water, circulating water, etc. These strainers are installed either outside or inside of the buildings and in any position, horizontal, vertical or inclined. They also have the advantage of being made up of different sections, which can be cleaned, one at a time, without interrupting the flow of water.

The strainer consists of a cast-iron body, having a number of removable strainer baskets, the number depending upon the size of the line. As these baskets can be easily removed for cleaning, without shutting down the pumps, the mesh is made very fine.

Referring to the illustration, it will be seen that the water enters through the inlet pipe, passes up to the top of the valve chamber, where it divides, going down through all of the baskets in multiple. When it is desired to clean the strainer, one of the baskets is drawn to the upper part of the chamber by turning the hand-wheel. At the same time the valve collar is forced tightly against the valve seat and the valve disc on the bottom of the basket seats on the valve collar. This is done automatically and entirely shuts off the water supply from the section containing the basket to be cleaned. By means of a small by-pass the pressure in this chamber is now relieved, the bolts at the top loosened and the flange cap tilted over, exposing the basket. The basket can now be taken out and cleaned. In replacing the basket the operations are exactly the reverse.

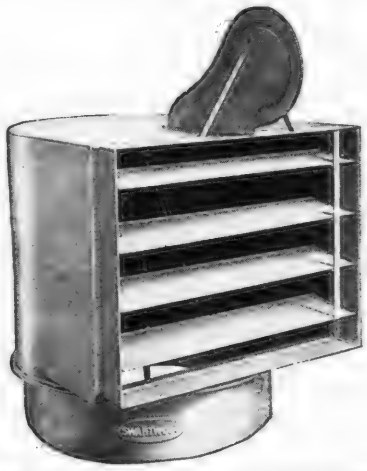
The effective straining area of a Lagonda strainer is from two and a quarter to four times the area of the pipe line and, in removing one basket for cleaning, the straining area is not reduced more than 30 per cent.

Lagonda multiple strainers are built in sizes from 2 to 48 in., having two to six baskets, the number depending upon the size of the strainer. They are also suitable for use in either suction of pressure lines and are built to stand a working pressure up to 200 lbs. per sq. in.

Further details concerning the various uses or these multiple strainers can be had by addressing the Lagonda Manufacturing Co., Springfield, Ohio.

The New Swartwout Ventilator

The "Swartwout" rotary ball bearing ventilator, made by the Ohio Blower Co., Cleveland, Ohio, has been designed by



NEW SWARTWOUT VENTILATOR, OPEN

those already experienced in the making of stationary ventilators. This new ventilator, which handles about 33⅓% more air than some forms, is of the revolving type, practically the entire ventilator moving on ball bearings. Any movement of air across the top induces a ffow of air or steam from below, the flow being entirely unobstructed in the air shaft or ventilator.

When open, the four dampers or louvres offer a large area for the escape of air, which in this type of ventilator makes but one turn. The maximum area for discharge is always effective because the wind blows away from, never into the openings.

The four dampers of the "Swartwout," hinged to the same rod, close simultaneously by gravity, and are opened by pulling a chain from within. When closed, these louvres shut so tightly that tthe entire ventilator is stormproof and dust-proof, completely protecting the few moving parts. The ventilator is in operation at all times.

The construction is such that a glass top, secured with waterproof cement, is readily substituted for the metal top, making a combination skylight and ventilator. Because of the location and operation of the louvres, the light is never excluded, this being considered a valuable feature because in stormy weather, when the louvres are closed or partially closed, most light is wanted.

To obtain greatest durability this ventilator is made of Toncan metal, a rust-resisting material which is considered superior to charcoal iron and steel plate for exposed sheet metal work.

SIDE VIEW OF NEW SWARTWOUT VENTILATOR

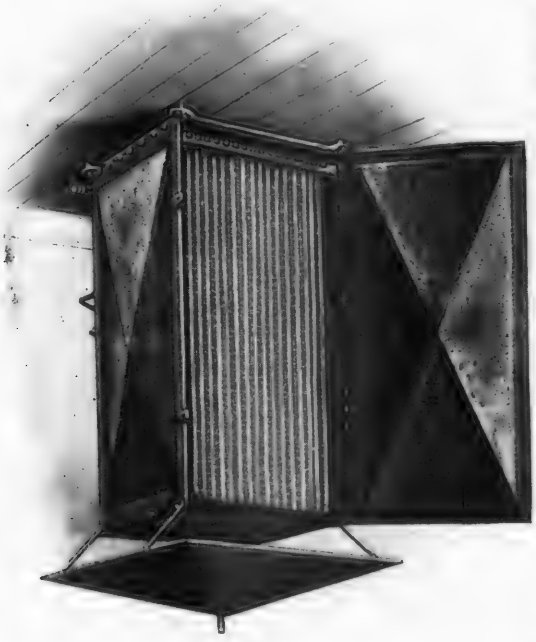
The Bell Humidifying System

The Bell humidifying system is especially adapted for use in textile mill work, and, in its small applications, in the cigar and tobacco field. The principle of the Bell system is the supplying of moisture to the air by evaporation from surfaces of moistened cloth placed in sufficient

BELL HUMIDIFIER, SHOWING FAN

number and in proper position along a duct or casing, through which a current of air is forced by a ventilating fan of disc type. By a proper relation between the speed of the air current, the area of the cloth surfaces, and the location of the

humidifying apparatus, the air circulating through the casing may be gradually and evenly humidified up to near the saturation point. With the use of this system it has been found that under no practical conditions can spray drops be carried, or formed, or deposited on machinery or metal surfaces.



BELL HUMIDIFIER, SHOWING INTERIOR

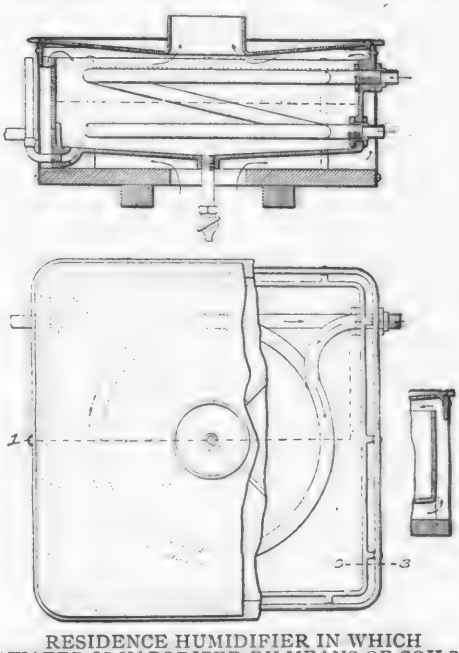
The Bell humidifier consists of a case of sheet copper, containing a number of sheets of moistened cloth placed parallel to each other about 1 in. apart. Between these sheets of cloth air is circulated by a disc fan. The current in its passage evaporates moisture from the sheets, which are supplied with water, either by dipping into a reservoir, in the case of the smaller machines, or by a system of piping flowing water over the sheets from the upper edges, in the larger sizes. The speed of the current and area of the sheets are so related that the humidity produced is constant. In passing through the casing the temperature of the air is slightly lowered by the evaporation. This has a double advantage; in hot weather a decided cooling of the room being humidified is produced and under all conditions the subsequent passing of this cooled and humidified air into the warmer temperature of the room around it lowers the relative humidity enough to insure against accidental deposition of moisture, in case the air comes in contact later with cool surfaces, windows, walls or machinery.

Small Bell humidifiers have been used for several years in cigar stock rooms and show cases. The brisk circulation of the air in the storage space, and the even humidity imparted to it, have a very beneficial effect upon the condition of tobacco stored in such spaces, which prevents the growth of mould, and is unfavorable to insect life. Cigars stored in a properly humidified atmosphere assume the finest possible condition, and are far superior to similar cigars stored in unevenly humidified space, or under the usual winter conditions of extreme dryness of the atmosphere.

Bell humidifiers are separate units installed in proper numbers in the space to be humidified. Each unit is self-contained, and independent of all others, and can be operated singly, if desired. The independence of the units offers many advantages over any central-station system where the operation of all humidifiers is dependent upon a single source of power, or a single high pressure pump. With the output of a factory dependent upon the maintainance of proper atmospheric conditions, it is of the greatest importance that no ordinary accident shall destroy the conditioning of the air, and seriously affect the performance of the whole operation. This system is manufactured by the Griscom-Spencer Co., 90 West Street, New York.

A Residence Humidifer

Another device invented by A. W. Thompson, mechanical superintendent of the Amoskeag Mills, Manchester, N. H., and which will be marketed by the G. M. Parks Co., Fitchburg, Mass., is especially



RESIDENCE HUMIDIFIER IN WHICH WATER IS VAPORIZED BY MEANS OF COILS

designed for use in dwellings heating either by hot water or steam. The device is briefly a receptacle for water containing also a steam or hot water coil. The air for the house is made to pass over the heated water, absorbing a certain amount of vapor on its way. The receptacle is made of copper and the coil, which is partially submerged in the water, is of ¾ in. brass tubing. The air follows the course indicated by the arrows in the illustration. Entering the bottom of the receptacle, it passes upwards around the sides and thence over the water to the outlet at the top. A portion of the coil which is not submerged serves to heat the air. The device may be fitted with a ball cock to control the water level and a water gauge may be added, if desired.

The manufacturers state that the humidifier should be located directly underneath the main floor of the house with an opening through the floor. It has been estimated that a device similar to that illustrated, containing 5 ft. 1 in. of brass tubing, will evaporate 14 lbs. of water per hour.

Heating Exhibit at the New York State Fair

Notable exhibits of steam and hot water heating apparatus were a feature of the recent New York State fair, held last month in Syracuse. One of the most interesting and conspicuous displays was that of the Pierce, Butler & Pierce Mfg. Co., of Syracuse, whose line of Tourain Modern, Spence and American boilers and radiators were shown in a specially designed booth. The exhibit was in charge of W. A. Schleit, assistant manager of sales. In addition to the other apparatus the display included a new lowdown type of laundry stove with big fire pot.

An Automatic Relief Valve for Steam Heating Systems

An ingenious type of valve for use as an automatic relief valve for heating systems in which the heating medium is exhaust or low pressure steam is shown in the accompanying illustration. It is known as the Mowell valve and is manufactured and sold by Augustus Mowell, 249 Graham Ave., Paterson, N. J.

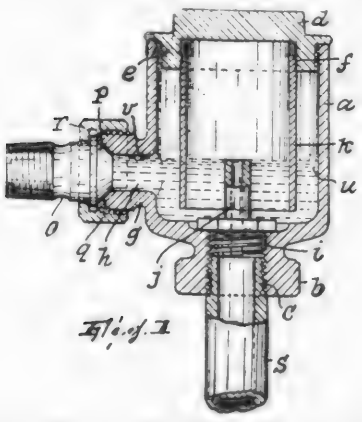
The unique feature of the valve lies in the use of a small aperture which permits the outflow of air but which closes against steam on account of the formation of a globule of condensed steam which effectually obstructs the opening.

In the construction of the device the inner chamber a has a nipple j extending up from the bottom and forming the outlet to pipe s. The top of this nipple is approximately in the same level as the top of inlet v. In chamber a is a depending cylinder, which projects far enough down to form with nipple j a water seal. This cylinder has a small vent k. When steam enters the system, water of con-

EXHIBIT OF THE PIERCE, BUTLER & PIERCE MFG. CO., AT THE NEW YORK STATE FAIR SYRACUSE, N. Y.

lensation first passes through the radiator and finds its way out through chamber a, via nipple j, this water is followed by air, which, being prevented by the water seal from escaping directly through nipple j, escapes indirectly through vent k. Finally, the steam following the air attempts to escape through k, but this at once stops because a globule of condensed steam forms and obstructs k.

A vacuum pump is used with this de-



THE MOWELL AUTOMATIC RELIEF VALVE

vice exerting a low pulling effect on the interior of chamber a. This pump serves to maintain a circulation through the system.

Thus while water and air are immediately withdrawn from the system, there is no appreciable waste of steam; also, in consequence of the immediate removal of the water and air, followed directly by steam filling each radiator, the radiators heat up immediately the system is put into operation.

A Georgia Law for the Protection of Those Furnishing Material and Labor for Public Work

A new law designed to protect persons furnishing material and labor for the construction of public works, and for other purposes, has recently been passed in Georgia at the instance of Henry A. Alexander, representative of Fulton County, a member of the Atlanta bar and author of "Materialmen's Lien Laws of the Southeastern States." The text of the law which was approved August 12, 1910, is as follows:

Section 1. Be it enacted by the General Assembly of the State of Georgia, and it is hereby enacted by authority of the same, that hereafter any person, firm or corporation entering into a contract with this state or a county or municipal corporation thereof for the repair, construction or prosecution of any public building or public work, shall be required, before commencing such work, to execute a bond, payable to the state, county or municipal corporation, with good and sufficient surety, approved in writing by the authority having charge of the making of such contract, conditioned that such contractor or contractors shall promptly make payment to all persons supplying him or them with labor or material, or both, in the execution of the work provided for in such contract.

Section 2. Any person, firm or corporation supplying the contractor with labor or material, or both, after the complete performance of their contract, and within a year, shall, upon application therefor, and furnishing affidavit to the authorities under the direction of whom said work has been prosecuted, that labor or material for such work has been supplied by him or them, and that payment for same has not been made, be furnished with a certified copy of said bond, and shall, within said period, have a right of action thereon, and shall be and are hereby authorized to bring suit on said bond in the name of the state, county or municipal corporation for their use and benefit and to prosecute the same to final judgment and execution.

Section 3. Be it further enacted that all laws and parts of laws in conflict herewith be and the same are hereby repealed.

Instances of the Relative Heating Efficiency of Live and Exhaust Steam

That the cause of the apparently greater heating efficiency of exhaust steam over that of live steam is as great a puzzle to central station heating engineers as to the heating profession generally may be gathered from a discussion of the subject at the recent annual convention of the National District Heating Association.

One speaker stated that the relative cost of the two systems was a matter more probably of plant efficiency. Mr. C. R. Bishop, of Lockport, N. Y., called attention to the fact that in a test of the plant operation in thirty office buildings in Philadelphia and New York, in every case it was found that the consumption of fuel was greater on Sunday than any other day of the week and this, too, despite the fact that during the Sunday consumption there were practically no lights burning in the building, no elevators moving, except perhaps an hour or so at noon. These results were duplicated in every isolated test made in those cities.

Mr. F. H. Stevens said that some eight years ago in Chicago the engineer operating the plant of Montgomery, Ward & Company, which has 20,000 sq. ft. of radiation, called his attention to a similar situation which he had met in his plant with reference to the fuel consumption on Sunday.

Radiator Control

A steam radiator is usually proportioned to heat a room comfortably in zero weather. It stands to reason that in warmer weather the radiator is too large. For with ordinary valves there is no way to cut down the steam supply without stopping it altogether. Thermostatic systems with coördinated control of supply and return have proved that modulation of temperature is practicable, but the cost is too great and they are too complex for small buildings.

With ordinary valves on both supply and return it is impossible to graduate the steam supply or the heated surface of the radiator. The advent of the small automatic trap upon the return and, whereby the water and air could be allowed to escape without permitting steam to back up, opened the way for simple control of the rate of steam admission. But the opportunity thus presented for the modulation of temperature to the requirements of each room has until recently been realized and even now only to a limited degree by the general public. It is, however, possible by a proper combination of fractional supply valve and automatic discharge valve to so overcome all the objections to the ordinary arrangements for direct steam heating as to simplify control, economize steam and modulate temperature to the exact requirements.

Erosion of a Gasket Union

The accompanying photograph shows what was left of a gasket union which the Jefferson Union Co. was recently called upon to replace with one of their brass to iron seated unions.

The remarkable feature in connection with the erosion of this union is the fact that it was taken out in the condition shown only three weeks after it had been installed. It was called upon for severe service, as it connected a steam trap to a 6-in. water leg 440 ft. from the boiler, carrying steam which was delivered to the engine at 130 lbs. pressure. The trap and joint were located in a brick and cement pit and were covered with water in which there was considerable sand and grit.

EXAMPLE OF EROSION OF A GASKET UNION CAUSED BY SAND AND GRIT

It seems that the escaping steam must have stirred up sand and grit which was sucked into the current, and the steam jet threw the sand against the union, the combination working like a sand blast.

By using a union with an all-metal spherical seat ground to a perfect fit, an absolutely tight joint can be secured with no soft, flexible matter between which can be blown out with high pressure steam.

Trade Literature

Emerson Furnace Blower, described as a remedy for the small or inefficient furnace, is described in new circular matter being sent out by the Emerson Electric Mfg. Co., St. Louis, Mo. The fan is operated by an eelctric motor, both fan and motor being located at the base of the fresh air inlet.

Heating Boilers for Steam, for Water, is the title of a handsomely-printed new catalogue published by the Walker & Pratt Mfg. Co., Boston, illustrating and describing the New Walker, Crawford and Crawford Cadet line of heaters. The matter of ratings is treated in an interesting manner by the presentation of two ratings in parallel columns. The ratings in the first columns are based upon a slow-burning fire, with an extreme rate of combustion in the coldest days of winter of 5 lbs. of coal per square foot of grate or firebox area. This rating is to be used for ordinary installations, with attendance in the coldest weather about every 8 hours. The second column of ratings is for boilers to be run at a higher rate of combustion with more frequent attendance. Both ratings are guaranteed to the extent that "every boiler, if properly piped and connected to a good chimney, will maintain in zero weather, with reasonable fuel and care, if a water boiler, a temperature of 180° at the boiler; if a steam boiler, a pressure of 5 lbs. of steam, when connected to the full amount of radiating surface in our tables." The catalogue gives details, including capacities and prices for the "15," "20," "30" and "40" series of the new Walker Boiler for water and steam; and for the Craw-

ford and Crawford Cadet series for water and steam. Size 8x10¼ in. Pp. 36.

High Efficiency of Centrifugal Pumps is a 96-page book brought out by the De Laval Steam Turbine Co., Trenton, N. J., containing some 75 charts, diagrams, photographs and a large amount of engineering information relating to such subjects as ways and means for testing centrifugal pumps, charts of the results of such tests, the interpretation of these charts for the purposes of the engineers, etc.

The book also discusses the relative importance of different features of pump design, as accessibility, the influence of impeller design upon the efficiency, the question as to the desirability of the diffusion vanes, the methods of preventing leakage between the discharge and suction chambers, the use of suitable bushings, sleeves, etc., to prevent corrosion of important parts, the manufacturer of pumps to limit gauges so that all parts are strictly interchangeable, the balancing of multistage pumps, and the design of bearings for high speeds. It then takes up the adaptation of centrifugal pumps for all methods of driving and classes of service.

The pumps illustrated are adapted for delivering against heads varying from a few feet up to 1600 ft., as for hydraulic pressure service, while the capacity varies from small boiler feeders up to pumps delivering 30,000 gals. per minute.

Valuable suggestions are given for the drawing up of specifications and for testing pumps to ascertain whether or not specifications have been made. In this connection it is stated that the DeLaval Steam Turbine Co. guarantees beforehand the characteristics of the pumps built by it and subjects each pump to a thorough test at the works. The purchaser is invited to witness this test and a full report is supplied to him. This book will undoubtedly prove of interest to anyone having to do with pumping machinery in any way.

J-M Leak-No Metallic Compound is described in newly-issued circular matter published by the H. W. Johns-Manville Co., New York as a powdered iron, which, when mixed with water and applied like putty, amalgamates with the metal to which it is applied and becomes a permanent part of the casting. It is warranted by the manufacturers to stop any ordinary leak in anything made of iron or steel against any pressure of oil, steam, gas, ammonia, brine or water and to stand any heat or chemicals that iron will stand, if applied according to directions. The company offers to send a 5-lb. can on 30 days' trial.

Ilg Self-Cooled Motor Fans, direct and alternating current, are the subject of a newly-issued bulletin, No. 27, giving capacities and price lists for both types, also for Ilg volume blowers for forges and for exhausting dust and fumes, as well as for removing steam and heavy vapors. These fans and blowers are made by the Ilg Ventilating Co., Chicago, Ill.

Vacuum Patent Decision for the C. A. Dunham Company.

After nearly four years of litigation an action for injunction and damages on account of alleged infringement of Hall Patent No. 454,964, instituted by Warren Webster & Co. against the C. A. Dunham Co., of Marshalltown, Ia., has been decided in favor of the C. A. Dunham Co. The latest decision was taken on an appeal by Warren Webster & Co. from the decision of the United States Circuit Court upholding the stand taken by the Dunham Co.

On September 19 a decision was made by the United States Circuit Court of Appeals, opinion by Judge Sanborn, in which the decree of the United States Circuit Court for the Southern District of Iowa is affirmed.

New Incorporations

Home Heating and Lighting Co., Oklahoma City, Okla., capital $100,000. Incorporators: E. J. Dupree, W. T. Croslen, W. E. Hudson and E. J. Morgan, all of Oklahoma City.

American Auxiliary Heating Co., Boston, capital $100,000. Incorporators: Daniel J. Kiley, William J. Carlin, Henry D. Crowley.

Imperial Heater Co., Kansas City, Mo., capital $100,000. Incorporators: W. Z. Flannery, R. L. Wilder, George B. Cushman.

Arkansas Heating and Plumbing Co., Little Rock, Ark., capital $25,000, to conduct a general heating and plumbing business. President, C. E. Adams; vice-president and general manager, W. A. Slater; secretary and treasurer, W. E. Ingram.

Dixie Heating and Ventilating Co., Shreveport, La., capital $25,000, to take over the business of the Dixie Heating Co.

Somerville Mfg. Co., Somerville, Mass., incorporated to manufacture a water meter. President, Frank L. Tibbets; treasurer, Elmer S. Stack, the inventor of the device; secretary, William P. French; sales manager, E. N. Hook.

Cochran Pipe Wrench Mfg. Co., Chicago, capital $100,000, to manufacture pipe wrenches and other tools.

Just Off the Press *The Book of the Year*

Handbook for Heating and Ventilating Engineers

BY

James D. Hoffman

PROFESSOR OF ENGINEERING DESIGN, PURDUE UNIVERSITY

ASSISTED BY

Benjamin F. Raber, B.S., M.E.,

INSTRUCTOR IN ENGINEERING DESIGN, PURDUE UNIVERSITY

320 Pages, with 45 Page Appendix

Size $4\frac{1}{2}$x$6\frac{3}{4}$ *in., bound in flexible leather*

VENTILATION, HUMIDITY AND HEAT LOSSES—
44 pages, 11 figures, 8 tables and 13 formulas.

FURNACE HEATING—
28 pages, 12 figures, 1 table and 16 formulas.

HOT WATER AND STEAM HEATING—
44 pages, 31 figures, 3 tables and 7 formulas.

PLENUM WARM AIR HEATING—
52 pages, 22 figures, 13 tables and 32 formulas,

MECHANICAL VACUUM HEATING—
12 pages and 11 figures.

DISTRICT HOT WATER AND STEAM HEATING—
62 pages, 13 figures, 3 tables and 39 formulas.

TEMPERATURE CONTROL—
10 pages and 9 figures.

ELECTRICAL HEATING—
3 pages and 2 formulas.

COURSE OF INSTRUCTION—6 pages.

PLANS AND SPECIFICATIONS—7 pages.

By mail, postpaid, $3.50. Address

Heating and Ventilating Magazine Co.

1123 BROADWAY, NEW YORK

TRADE AND MISCELLANEOUS NOTES

Coming Events

Dec. 6-9, 1910. Annual meeting of the American Society of Mechanical Engineers, New York. Headquarters at the Engineering Societies Building, 39 West 30th St.

Dec. 7-9, 1910. Annual meeting of the American Institute of Chemical Engineers, New York.

Jan. 24-26, 1911. Seventeenth annual meeting of the American Society of Heating and Ventilating Engineers, New York. Headquarters at the Engineering Societies' building, 39 West 39th St.

Deaths

Albert Spies, for many years editor of Cassier's Magazine, and afterwards editor of Steam, died August 16, at his home in Jersey City. He was 48 years old. At the time of his death he was editor and president of Foundry News, a new publication which he established in May of this year.

Manufacturers' Notes

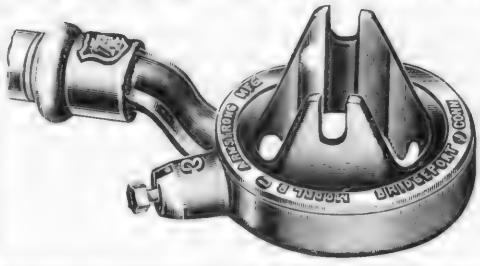
Nelson Valve Co., Chestnut Hill, Philadelphia, moved into its new plant at Wyndmoor September 1.

Haines, Jones & Cadbury Co., Philadelphia, manufacturers and jobbers of heating and plumbing supplies, has purchased the supply business of the G. & A. Bargamin Co., of Richmond, Va., one of the oldest supply houses in the country.

D. T. Williams Valve Co., Cincinnati, O., has purchased the business and plant of the Bickford Drill & Tool Co., of that city.

H. W. Johns-Manville Co., New York, manufacturer of asbestos products, announces the opening of two new branch offices, one at Atlanta, Ga., and one at Rochester, N. Y. The Atlanta office is located in the Empire Building in charge of W. F. Johns, who has been covering this territory for the company for a number of years. The Rochester office is at

Armstrong Ratchet Attachment



MADE TO FIT ALL SIZES

ARMSTRONG HAND STOCKS

EXCEPT NO. 1

MANUFACTURED BY

THE ARMSTRONG MFG. CO.

321 Knowlton St., Bridgeport, Conn.

CATALOG MAILED ON REQUEST

ROBERT A. KEASBEY CO.

"RAKCO" BRAND PACKINGS and GASKETS OF ALL KINDS

100 North Moore Street
NEW YORK CITY

Send for Sample of "RAKCO" Red Rubber Sheet Packing, Style No. 10.

Telephone 6097 Franklin

725 Chamber of Commerce, in charge of H. P. Domine, formerly with the company's Buffalo branch.

Detroit Injector and Brass Mfg. Co., Detroit, Mich., has purchased the business of the Osoeze Mfg. Co., manufacturers of the Armstrong radiator trucks. The company's capital stock has been increased to $40,000, to provide for additional facilities for manufacturing the Armstrong radiator truck.

Lagonda Mfg. Co., Springfield, O., has taken over the Enterprise Machine Mfg. Co., acquiring the rights and patents of the latter company's line of water strainers and tube cleaners. This strainer, which will now be known as the Lagonda-Enterprise strainer, has been further improved, being designed to remove impurities from boiler feed water, circulating water, etc.

John Simmons Co., New York, announces the removal of its New York showrooms to 48 East 31st St. The change was made October 3.

Ohio Blower Co., Cleveland, O., has increased its capital stock from $50,000 to $150,000. The company is building a new plant.

Moline Pump Co., Moline, Ill., will move its factory and main offices to Ottumwa, Ia., this month.

Pressed Radiator Co. of America, Pittsburg Pa., announces the appointment of J. F. Siegel as general sales manager, with headquarters at Pittsburg. Mr. Siegel has been for the past four years manager of the company's Chicago branch. A. M. Pearson, formerly general sales manager, has been elected secretary and treasurer of the company. The New York branch will hereafter be in charge of A. S. Sheahan, who succeeds S. H. Brooks as New York manager. Mr. Brooks has been appointed a department manager for the R. D. Kimball Co., heating engineers, Boston and New York.

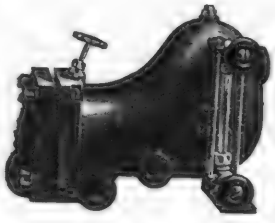
Miscellaneous Notes

August Building Operations compare favorably with those for a corresponding period a year ago. The eastern cities show a decrease of 14%. In the middle west cities, the increase was 61%, due almost wholly, however, to the filing by the United States Steel Corporation of plans for a $10,000,000 plant at Duluth, Minn. The Pacific coast cities showed an increase of 7% and the southern cities, 13%.

United Bunch of Sheep. New York Fold, held its first meeting of the season, September 14, with Grand Ram T. H. Hutchinson in the chair. Four new members were elected.

McDaniel Improved Steam Trap

WILL DO THE WORK



When you need a Steam Trap buy one you know will work. With a McDANIEL we take all the chances. Don't pay until you are satisfied. We have been 25 years manufacturing Steam Traps and know there is no better trap made. May we send you one for trial?

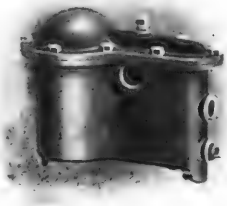
Watson & McDaniel Co.

160 North 7th Street - PHILADELPHIA, PA.

Send for Catalogue

The Empire Low Pressure Steam Trap

Means Trap Satisfaction



The trap question will be settled if you install an EMPIRE. Adapted to all classes of low pressure work. Perfectly automatic in operation. THE SIMPLEST TRAP MADE. Let us send you one on trial. You will be surprised at its low cost too.

ASK FOR BULLETIN 101

AMERICAN DISTRICT STEAM COMPANY

LOCKPORT, N Y. CHICAGO, ILL.

Virginia, Minn.—M. Boylan & Co. is installing a central heating plant for the Virginia Electric Power & Water Company which will furnish steam heat to a number of office buildings and residences.

Modern Science Club, 125 So. Elliott Place, Brooklyn, N. Y., opened its season Sept. 27, with a smoker. Following is the programme for October: Oct. 4, Address by Snowden B. Redfield on "Some of the Fundamental Principles of Engineering" Oct. 11, regular quarterly meeting of the club; Oct. 18, general discussion on "Some of the New Problems in City Buildings," opened by Charles A. Bavier, of the Metropolitan Life building; Oct. 25, illustrated lecture by A. R. Maujer, associate editor of Power, on "Peat as Fuel," including the production of producer gas from peat.

American Manufacturers' Export Association was organized in New York Sept. 12 for the purpose of promoting American export trade. The following officers were elected: President, W. B. Campbell, secretary Perkins-Campbell Co., Cincinnati, Ohio; first vice-president, J. K. Rodgers, E. I. du Pont de Nemours Powder Co., Newburgh, N. Y.; second vice-president, D. P. Mitchell, Victor Talking Machine Co., Camden, N. J.; third vice-president, D. E. Delgado, Eastman Kodak Co., New Haven, Conn. Among the directors of the new association is Alfred F. Howe, of the Borden Co., Warren, O.

C. M. Ripley, of New York, whose paper on "Heat, Light and Power in Buildings" was presented at the recent convention in Washington of the National Building Managers' Association, has been invited to present the same paper at a meeting of the Blue Room Engineering Society in the auditorium of the Engineering Societies' Building, New York, October 29. The paper will be discussed by Charles G. Armstrong, of New York, and others.

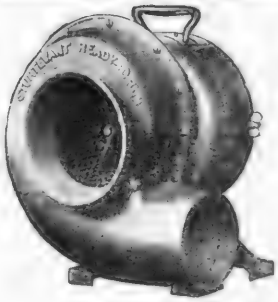
Prof. John R. Allen, formerly of Michigan University, who haas had charge of the equipment of a department of engineering at the Robert College, Constantinople, Turkey, has been appointed dean of the department. He reports that there is a greater demand for engineering talent in Turkey than in any other part of the world.

New Incorporations

Economy Appliance Co., Chicago, capital $2,500, to manufacture heating appliances. Incorporators: Max W. Zabel, Hazel Jones and O. M. Wermich.

Crook-Horner Co., Baltimore, Md., jobbers of heating and plumbing supplies,

Positive Ventilation for Moderate Size Rooms



THERE need be no more unventilated rooms in homes and offices. The STURTEVANT Ready-to-Run Electric Ventilating Set meets all ventilating requirements for small and medium size rooms.

It consists of a small patented Multivane fan of wonderful efficiency, direct connected to an electric motor, and is arranged to be used independently or attached to a window board.

It positively ventilates by blowing in fresh air or carrying away foul air. It is light, portable, easy to install, and runs from electric light socket. Numerous Heating, Ventilating and Sanitary Engineers and Plumbers are installing these sets in residences, clubs, offices, factories, laboratories, telephone booths and all *moderate* size places requiring ventilation.

Special prices to Heating and Ventilating Engineers, Electrical Houses, Hardware Dealers, etc. Retail price: Size A, $35.00; B, $45.00; C, $55.00.

B. F. STURTEVANT CO., Hyde Park, Mass.

capital $100,000. Incorporators, William A. Pitcher and Harry A. Booth.

Makin Heating Co., Philadelphia, to take over the business of John A. Makin, at 803 Locust St. The company will manufacture heating and ventilating apparatus. Incorporators: John S. Makin, Albert H. Dunn, Jr., and Robert F. Morgan.

Crandon Mfg. Co., Bellows Falls, Vt., to manufacture electric heat regulators, invented by J. B. Crandon. Among those interested are J. B. Crandon, Jay H. Brink and R. C. Bidwell.

Stearns & Waterman Co., Boston, capital $50,000, to manufacture heating apparatus. President, Fernando L. Waterman, Woburn; treasurer, Edward T. Willis; secretary, Arthur P. Teele, Waltham.

Atlas Engineering Co., Cleveland, O., capital $15,000, to conduct a general engineering business. Incorporators: Gustave Bradenberg, John P. Mystrom, John E. Nygreen, William Beckman and August Larsen.

Pillsbury & Baldwin Co., St. Johnsbury, Vt., capital $100,000, to manufacture heating and plumbing specialties. Incorporators: Frank D. Thompson and Fred H. Pillsbury, Barton; Charles W. Steele, John Rickaby and Joseph Fairbanks, St. Johnsbury.

New Contracts

E. H. Hannon, Paducah, Ky., heating and plumbing new cell houses at the Eddyville Penitentiary.

Clark & Jones, Lima, O., heating and ventilating East School building at Ottawa, O., for $4,330. E. E. Tuttle, of Lima, has the plumbing contract at $2,125.

W. J. Hyland, Springfield, Mass., heating and ventilating police building in that city for $3,693. George R. Estabrook, Springfield, heating and ventilating fire building in Springfield for $1,722. Both buildings will be connected with the central heating plant which will supply heat in addition to a number of other municipal buildings. Donahue Bros., Springfield, Mass., have the plumbing contract of the new police building at $6,758.

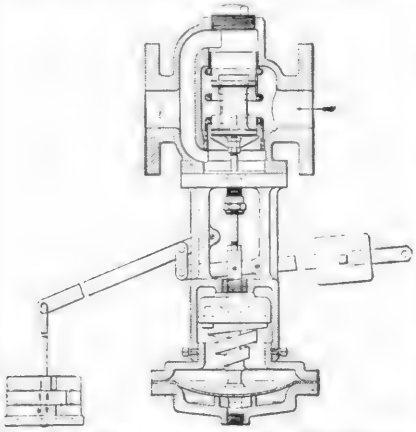
Weaver Heating Co., Columbus, O., installing between 30 and 40 warm air furnaces in seven exhibit halls at the State Exposition grounds, in that city, for the fourth annual National Corn Exposition to be held January 30—February 11, 1911.

St. John Plumbing Co., Colorado Springs, Colo., heating 12-story Foster building, Central National Bank building and also 6-story building for Dr. Foster. The contracts amount in all to $35,000.

James P. Dwyer, Boston, heating and ventilating Curtis Hall, in that city, for

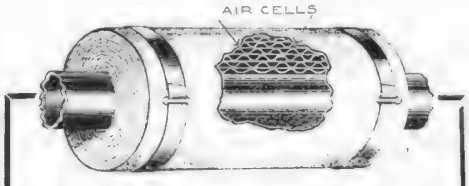
WATERS
Reducing Valves

for steam heating purposes a specialty. Also valves for vacuum heating systems.



Manufactured by

Waters Governor Co.
34 Oliver St., Boston, Mass.



J-M Asbestocel Pipe Covering is Fireproof

Being made of asbestos, **J-M Asbestocel Pipe Covering** does away with the danger of fire from overheated pipes.

It is the most efficient covering for hot water, hot air and low pressure steam heating systems, because it is built on the principle of the arch with the air cells running around the pipes, instead of from end to end, which construction confines the greatest amount of dead air. Will pay for itself in fuel saved in 8½ months.

Cannot crack, break or lose its insulating value from rough handling or vibration.

Write Nearest Branch for Sample and Booklet.

H. W. JOHNS-MANVILLE CO.

Baltimore	Detroit	New York
Boston	Kansas City	Philadelphia
Buffalo	London	Pittsburg
Chicago	Los Angeles	San Francisco
Cleveland	Milwaukee	Seattle
Dallas	Minneapolis	St. Louis
	New Orleans	(872)

$22,277. Michael Ahern has the plumbing contract at $6,237. Other bidders for the heating and ventilating work were: Ingalls & Kendricken, $22,590 C. H. Sanborn, $22,714 Alexander Duncan Co., $22,647; F. W. Zemier & Co., $22,775; Lynch & Woodward, $22,786; Pierce & Cox, $23,293; W. H. Gallison Co., $24,825; Buerkel & Co., $25,576; Chase & Baker, 25,720; J. J. Hurley & Co., $33,980.

Whittman, Lyman & Co., San Francisco, Cal., heating and ventilating Adams Grammar School in that city.

Gaylord & Eitapenc, Scranton, Pa., heating and ventilating School No. 21 at Scranton, for $3,793.

Baker-Niebuhr Co., La Crosse, Wis., heating St. Michael's Orphanage at that place for $9,200. The plumbing contract went to the Thill-Manning-Whalen Co. at its bid of $4,660. The heating contract calls for an overhead system of low pressure steam. The heating pipes connecting the boiler house to the main building are to be laid in a tunnel 6 ft. wide, 6 ft. 4 in. high and 100 ft. long, the roof of the tunnel to be used as a sidewalk from the orphanage to the boiler house.

Buffalo Heating Co., Buffalo, N. Y., heating and ventilating Ernest Wende Hospital at Broadway and Spring St., Buffalo, for $3,079.

Keith & Fitzsimmons, Toronto, Can.,

JENKINS '96 PACKING

Makes tight and leakless steam joints. And ammonia, oils or acids do not affect it. On permanent work it will last as long as the metals which hold it. For temporary work, when properly applied, it can be used repeatedly. It is strong, tough and flexible.

It is guaranteed.

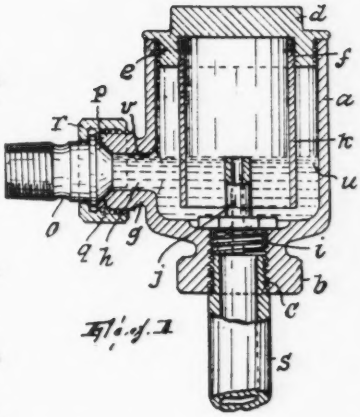
JENKINS BROS., New York, Boston, Philadelphia, Chicago

MOWELL'S

MOWELL'S

Automatic Relief Valve

For exhaust and low pressure steam heating



Expels all air and water from the radiator.
Can't get out of order.
Will stand as much pressure as standard fittings.
Parts easily cleaned if necessary.

A POSTAL WILL BRING PARTICULARS

AUGUSTUS MOWELL, 249 Graham Avenue, Paterson, N J.

heating and ventilating Manning Avenue School, Toronto, for $5,495.

Lennig-Rapple Engineering Co., San Francisco, Cal., heating city and county jail for $14,430.

Crain-Stuart Co., Springfield, O., heating Kelly Motor Truck Co.'s plant at Springfield; also heating new office building of the Foos Mfg. Co. The two contracts amount to $10,000.

Hanley-Casey Co., Chicago, heating post-office building at St. Louis, Mo., for $75,650. The other bidders were: G. A. Kees, Domestic Engineering Company, St. Louis, $89,200; Bradley Heating Company, St. Louis, $98,620; Fitzpatrick & Hoepner, Columbus, Ohio, $89,880; S. Faiett Company, Philadelphia, Pa., $93,339; Materne Manufacturing Company, St. Louis, $93,219.

Bryce Heating and Ventilating Co., Toledo, O., heating and ventilating East Side School building for $3,498.

Bartlett Bros., Youngstown, O., heating plant in the South Side High School, for $27,950.

Lewis & Kitchen, Kansas City, Mo., were the lowest bidders at $5,329 for the additional heating apparatus for the public "Zoo" at Swope Park.

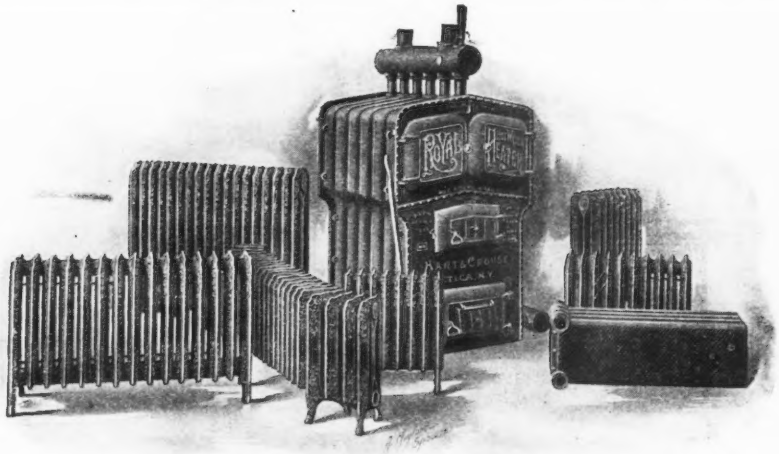
W. H. Johnson & Sons Co., Indianapolis, Ind., heating and ventilating plants for the Conn Band Instrument Co.'s factory, also the Angildile Computing Scale Co.'s factory. Also heating new county jail and courthouse at Bloomfield, Ind., for $3,275.

C. M. Masters, Mankato, Minn., heating and plumbing Martin Luther College at New Ulm for $4,000.

Lewis & Kitchen, Chicago, heating and ventilating college buildings at Mt. Pleasant, Ia.

Evans Plumbing & Heating Co., Freeport, Ill., steam heating and plumbing

DIXON'S PIPE JOINT COMPOUND
Is Steam Proof and Gas Proof
It is adopted as official standard by railroads, gas companies, and radiator makers. Write for free samples
JOSEPH DIXON CRUCIBLE CO. **Jersey City, N. J.**



Let us send you a few copies of "Heating and Ventilating the American Home"—an article in booklet form. You can distribute these to advantage among prospective homebuilders in your town.

HART & CROUSE CO.

BRANCHES: **Home Office: Utica, N. Y.**
New York, 607 Flatiron Building
Chicago, 80 Lake St.
Dallas, 659 Elm St.
Columbus, Poplar and Henry Sts.
Minneapolis, Exchange. 742 Lumber

court house building at that place for $5,000.

Thomas Heating Co., Racine, Wis., heating and ventilating new high school building at Richland Centre, Wis., for $11,575.

J. Woodring & Co., Hazelton, Pa., heating and ventilating Monroe School, at that place, for $2,523.

WANTED

Position Wanted, by heating and ventilating engineer, technical graduate, eight years' practical experience in heating and ventilating public buildings, school houses and factories. The fan system a specialty. Address S., care of HEATING AND VENTILATING MAGAZINE.

Salesman Wanted, by a heating and ventilating concern; one acquainted with architects and builders in the Borough of Manhattan. Salary and commission. Address, with full particulars, Morton, care of HEATING AND VENTILATING MAGAZINE.

Sales Engineer with well-known machinery firm, traveling through New York State, has opportunities for acquiring information valuable to sales departments of manufacturers and dealers in all lines of factory and power house equipment. Would be glad to communicate with firms in this line. Address Salesman, care of HEATING AND VENTILATING MAGAZINE.

BOOKS ON HEATING AND VENTILATION

Heating and Ventilating Buildings, a standard manual for heating engineers and architects. By Prof. R. C. Carpenter. Fifth edition, largely rewritten. 577 pages. 277 Ills., 8vo, cloth. $4.00.

Baldwin on Heating; or Steam Heating for Buildings By William J. Baldwin. Fifteenth edition. Revised and enlarged. 391 pages. 131 figures. Size, 5x7½ in. Contains descriptions of steam heating apparatus tor warming and ventilating large buildings and private houses, with remarks and tables. Cloth, $2.50.

Questions and Answers on the Practice and Theory of Steam and Hot-Water Heating. By R. M. Starbuck. Illustrated. $1.00.

The Ventilation of the Schoolroom. By William J. Baldwin. Price, $1.00.

Ventilation of Buildings. By William G. Snow and Thomas Nolan. 83 pages. Pocket size. Contains a statement of the general principles of ventilation and of their application to different kinds of buildings. Boards, 50c

Steam Heating and Ventilation. By Wm. S. Monroe. Containing formulas and data valuable in the designing of heating and ventilating plants. Price, $2.00.

Air-Conditioning. By G. B. Wilson. Being a short treatise on the humidification, ventilation, cooling and the hygiene of textile factories—especially with relation to those in the U. S. A. With figures. 12mo. Illustrated. 143 pages. Price, $1.20.

Steam-Electric Power Plants. By Frank Koester. A practical treatise on the design of Central Light and Power Stations and their economical construction and operation. 473 pages. 340 ills. Price, $5.00.

Light, Heat and Power in Buildings. By Alton D Adams, M. E. The purpose of this volume is to present in compact form the main facts on which selection of the sources of light, heat and power in buildings should be based. The problem is to determine the kind of equipment that will yield the service required at the least cost. 12mo. Cloth, $1.00.

Practical Steam and Hot Water Heating. By Alfred G. King. Containing over 300 detailed illustrations. The book is a working manual for heating contractors, journeymen steam fitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8vo. 367 pages. Price, $3.00.

Dean's System of Greenhouse Heating, by steam or hot water, with formulas for obtaining different temperatures, by Mark Dean. Price, $2.00.

Power, Heating and Ventilation. By Charles L Hubbard, B.S., M.E. A treatise for designing and constructing engineers and architects. The whole subject of heating is covered, including the heating of large institutions with central plants. Space is also devoted to electrical matters connected with steam plants. 647 pages. Price, $5.00 (three volumes in one).

Notes on Heating and Ventilation. By John R Allen. 152 pages. 34 illustrations. Size, 4½x6½ in. One of the new books, brought quite up to date, and containing much information to guide the intelligent steam fitter in the installation and heating and ventilating apparatus. Cloth, $2.00.

Hot-Water Heating and Fitting. By W. J. Baldwin Fourth edition. Price, $4.00.

Steam Fitters' Computation and Price Book, abridged. By Mark Dean. Price, $2.50.

Practical Treatise Upon Steam Heating. By F. Dye. Embracing methods and appliances for warming buildings, etc. Low pressure, high pressure and exhaust steam. 8vo, cloth, illustrated. Price, $4.00.

The School House. Its Heating and Ventilation. By J. A. Moore. 204 pages, illustrated. $2.00.

A Manual of Heating and Ventilation, for engineers and architects, embracing tables and formulas for dimensions of pipes for steam and hot-water boilers, flues, etc. By F. Schumann. Second edition, revised and enlarged. 12mo, $1.50.

German Formulas and Tables for Heating and Ventilating Work, especially adapted for those who plan or erect heating apparatus. By Prof. J. H. Kinealy. Illustrated. Price, $1.00.

Tables for Calculating Sizes of Steam Pipes. By Isaac Chaimovitsch. A manual for the determination of steam pipe sizes for low pressure heating. 48 pages. 4 insert tables. Price, $2.00.

Centrifugal Fans. By J. H. Kinealy. A theoretica and practical treatise on fans for moving air in large quantities at comparatively low pressures. 206 pages. 39 diagrams. Full limp leather pocketbook round corners, gilt edges. Price, $5.00.

The Principles of Heating. By William G. Snow. A practical and comprehensive treatise on Applied Theory in Heating. 161 pages. 42 illustrations. 38 tables. Size, 6x9 in. Cloth, $2.00.

An Outline of Warming and Ventilating By William J. Baldwin. Price, $1.00.

Modern Sanitary Plumbing, Steam and Hot Water. By James J. Lawler. 400 pages. 228 illustrations. Size, 6x9 in. This is the latest edition of Mr. Lawler's well-known work on this subject. Price, $5.00.

ADDRESS

The HEATING and VENTILATING MAGAZINE 1123 Broadway NEW YORK

Supposing

An experienced and widely-known heating and ventilating engineer should come to you and say, "Let me see you lay out a system of steam, hot blast or forced hot water heating, and I will watch you work and see that you do it right. I will not only correct any mistakes you make, but will suggest ways in which you can improve on your lay-out."

Would you do it?

Of course you would. You would jump at the chance. Supposing, further, that he told you he would give you his own private "dope," collected from innumerable sources, tested and tried out in hundreds of installations covering every type of heating system in commercial use to-day.

Would that interest you?

If so, let us tell you how we will undertake to do just that thing, not at some future time, but NOW.

A Postal Will Bring Full Particulars.

New York Heating & Ventilation School

1123 BROADWAY : : NEW YORK